

# Sikorsky S51



## HISTORY

With the success of the R4 helicopter, Sikorsky was encouraged to start work on improved versions. Two developments were planned; an improved two seat helicopter (ultimately becoming the R-6/HOS) and a larger observation helicopter for the USAAF, first ordered as the XR-5 in 1943. Followed by 26 pre-series YR-5As and 34 R-5As, these early machines can be distinguished by a narrow front fuselage and main gear on cantilever outriggers with a trailing tailwheel. Sikorsky was working on a larger variant of this machine for the commercial market and the S51 first flew on 16 February 1946.

The S51 was a four (1 + 3) seat machine powered by the Pratt and Whitney R-985 radial engine developing 450 hp. This gave it a payload of nearly 1000 lbs under most operating conditions.

While some of the early R-5As were upgraded to R-5D configuration, further military interest concentrated on the S51. A total of 66 examples were purchased for the USAF as R-5F, G and H. The USN was also interested and 91 examples of the HO3S-1 (similar to R-5H) were procured from 1946 to 1950. Nine were transferred to the USMC, becoming the first rotary wing machines operated by the Marines and another nine to the USCG as HO3S-1G. USN HO3S-1s were primarily used for plane guard rescue duties, operating from carriers or LSTs, while USMC machines did useful service in the medevac role.

The Royal Canadian Air Force picked the Sikorsky S51 for its first rotary winged air-

craft, purchasing 7 in 1947 for SAR work where they were known as the H-5.

In 1946, Westland Aircraft in the UK approached Sikorsky and arranged for license production of the S51 as the Dragonfly. Initially, 6 US-built S51s were purchased and used for trials and demonstrations while design modifications were made to allow the use of British materials and equipment, including the use of the Alvis Leonides 50 engine (520 hp) instead of the P&W engine. While enjoying some success commercially (BEA used them for the world's first passenger helicopter service in 1950), the majority of the 166 produced were used by the Royal Navy for search and rescue as the Dragonfly HR Mk 1 (and later Mk 3). A small number were also in service with the RAF as HC Mk 2 where they were used for casualty evacuation.

The Sikorsky S51 was instrumental in establishing the reputation of a helicopter as a useful SAR machine, while introducing the helicopter to the public as a reliable means of transportation. It also firmly established Sikorsky as one of the major names in helicopter development, a position the firm still holds today.

## GENERAL INSTRUCTIONS

This kit is designed to be simple in construction. However, some experience in building models with non-traditional materials would be an asset.

The instructions are designed to enable one to complete the model. However, if additional detailing is desired, it would be useful to consult some of the references listed at the

end of the instruction sheet. Having a few photographs of the real thing on hand while building a kit is always useful.

This kit is made of polyurethane resin. This resin sands slightly easier than polystyrene plastic, so go easy when filing, sanding and filling seams. Breathing polyurethane dust is hazardous so wet sanding is best; the use of a mask is recommended. Effort has been taken to reduce the number of pinholes to a minimum, but if any are present they can be filled with adhesive, putty or even thickened paint.

Parts are trimmed but not finished. Some pour or vent areas will require cleanup. This is especially important where these fall on mating surfaces. There is a little flash in some areas to remove. It is best to go through the kit and clean up all the parts at once; this gets the most boring job out of the way early.

The builder will be required to construct certain items which are too small to mould, such as the control columns.

Assembly requires the use of either epoxy or cyanoacrylate (super glue) adhesives. It is always a good idea to wash the parts in lukewarm water and mild detergent before assembly and definitely before painting.

There are no register marks to positively align parts; use care in fitting the parts. A few minutes spent at this stage will prevent hours of staring at a painted model with the tail out of line with the fuselage.

Prime the model before painting. Polyurethane resins accept model paints well, but a lacquer based primer will have a better 'tooth' to adhere to the material.

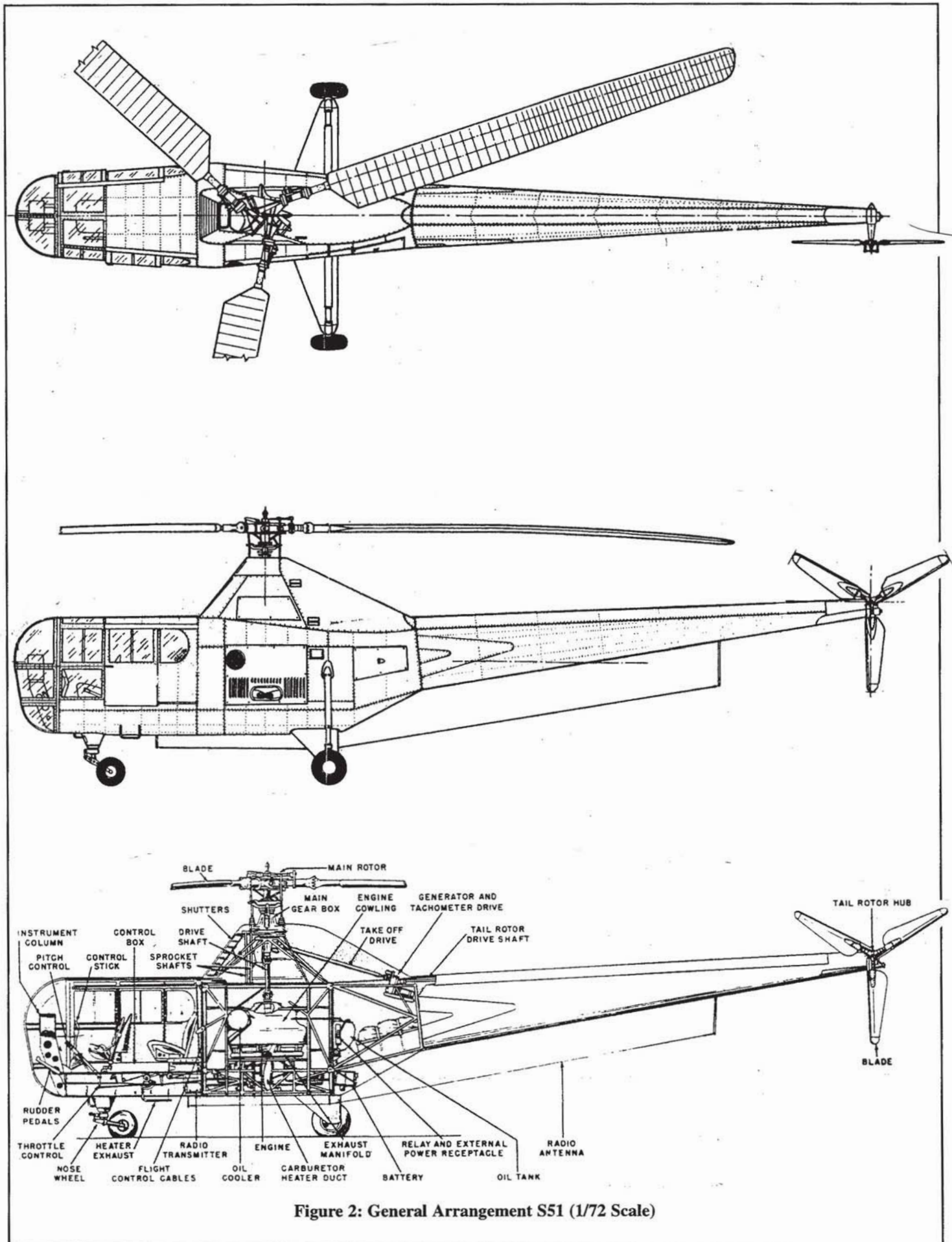
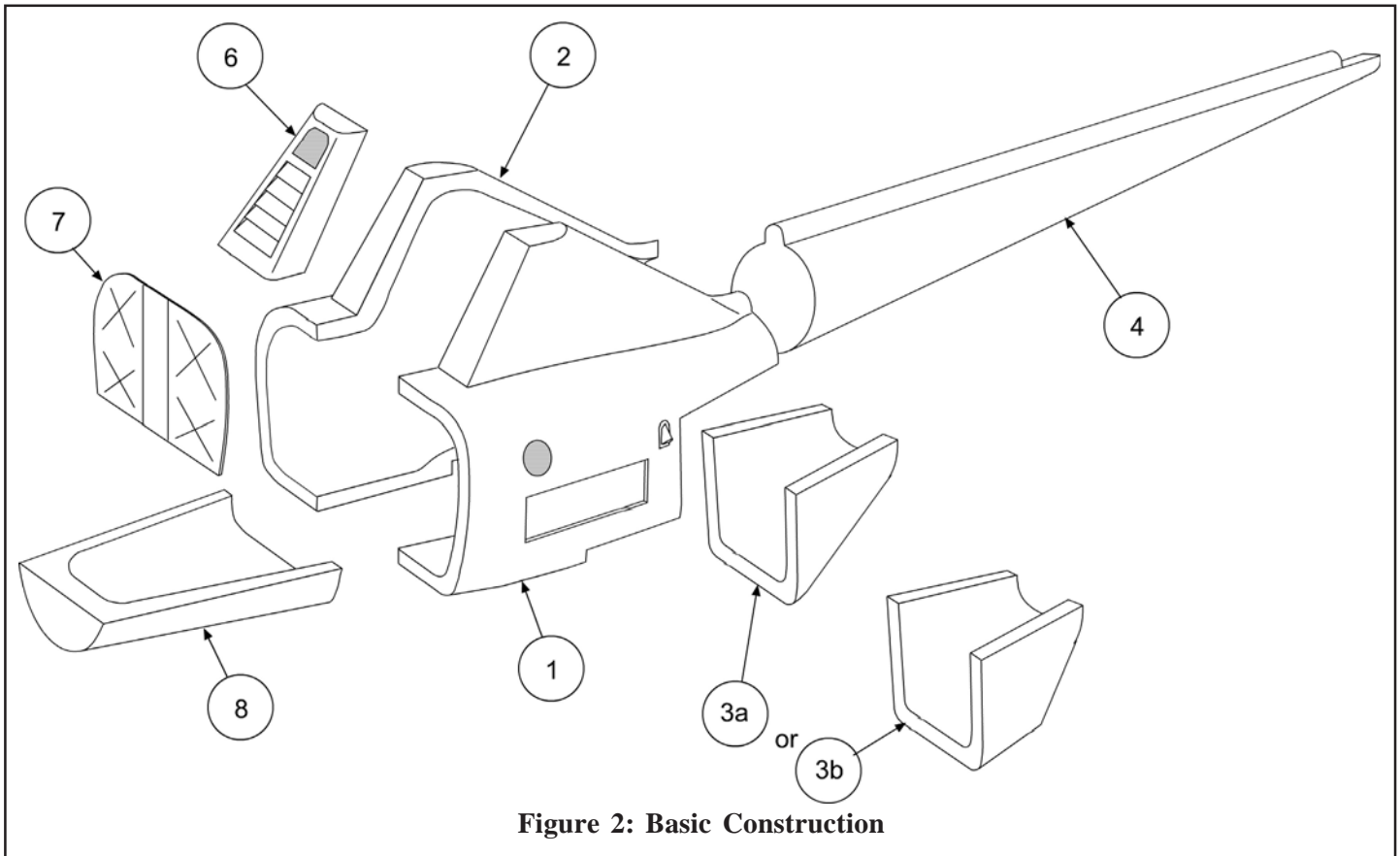


Figure 2: General Arrangement S51 (1/72 Scale)



**Figure 2: Basic Construction**

Please check to make sure your kit contains all the following parts. If any have been damaged or are missing, write to Belcher Bits for a replacement. A diagram is included to help identify some of the less obvious ones

**Resin Parts**

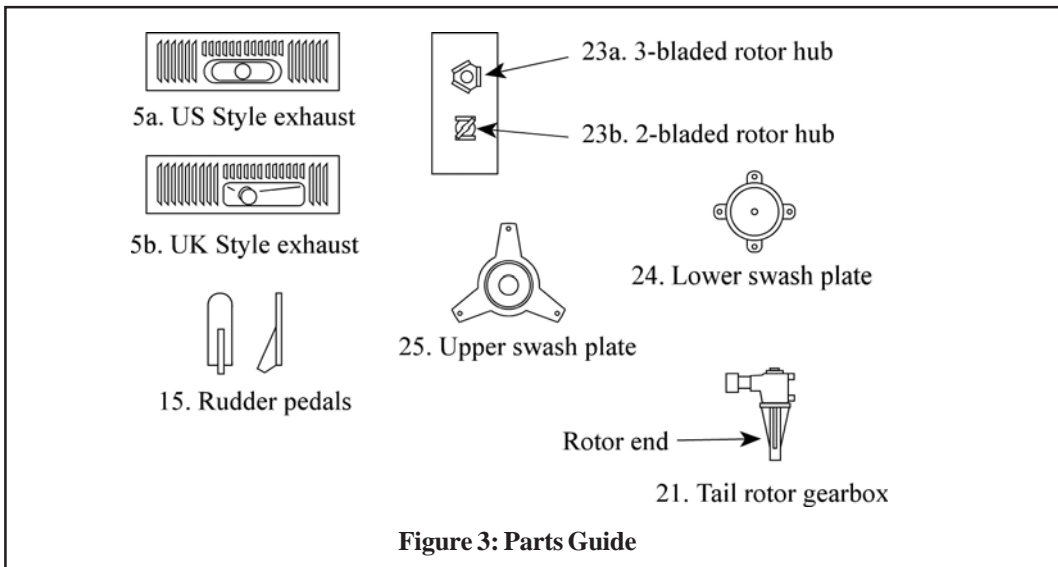
- |                                |                            |                                |                            |
|--------------------------------|----------------------------|--------------------------------|----------------------------|
| 1. Centre fuselage (Port)      | 8. Forward fuselage        | 19. Main gear strut            | 27b. Metal rotor blade (3) |
| 2. Centre fuselage (Starboard) | 9. Nose weight (metal)     | 20. Main gear wheels (2)       | 28. Pilot figure           |
| 3a. Aft fuselage (US Style)    | 10. Centre console         | 21. Tail rotor gearbox         | 29. Pilot figure arm       |
| 3b. Aft fuselage (UK Style)    | 11. Instrument Panel       | 22a. Tail rotor blade (3)      | 30. Top hat                |
| 4. Tailboom                    | 12. Pilot seat             | 22b. Tail rotor blade (2)      | 31. Rescue Hoist Frame     |
| 5a. Exhaust panel (US Style)   | 13. Pilot Seat Pan         | 23a. Tail rotor hub (3 bladed) | 32. Hoist Reel Flange      |
| 5b. Exhaust panel (UK Style)   | 14. Rear seat              | 23b. Tail rotor hub (2 bladed) | 33. Hoist Reel Motor       |
| 6. Pylon Front                 | 15. Rudder pedals (2)      | 24. Lower swash plate          | 34. Accumulator            |
| 7. Firewall                    | 16. Nose gear leg          | 25. Upper Swash plate          |                            |
|                                | 17. Nose gear trailing arm | 26. Main rotor head            |                            |
|                                | 18. Nosewheel              | 27a. Wooden rotor blade (3)    |                            |

**Clear Acetate Parts**

1. Cabin (port)
2. Cabin (starboard)
3. Forward Cabin (standard)
4. Forward Cabin (SAR style)
5. Cabin door (port)
6. Cabin door (starboard)

**Miscellaneous Bits**

1. 0.062" dia rod, 3" lg
2. 0.020" dia rod, 2"lg
3. 0.025" dia wire, 5" lg
4. 0.050" angle strip, 2.25" lg
5. 0.030"square strip, 3" lg
6. 0.010" sheet, 1.5" x 2"
7. Decal sheet
8. Instruction sheet
9. EZ Mask (2 sheets)



**Figure 3: Parts Guide**

## INSTRUCTIONS

1. Decide on the marking scheme you wish to build. Instructions will indicate when a decision is required.

2. For basic construction, refer to Figure 2. Glue the two centre fuselage halves together. Glue on the pylon front. File the top of the pylon flat. The marks on the top surface indicate the centre of the rotor. Sand the lower swash plat flat and glue it in place, with one of the four protrusions facing forward. Drill a 0.026" hole in the centre (for attachment of rotor head later).

3. **(Decision required)** Nearly all military S51s carried the rescue hoist. If you want to have the hoist installed, drill a 0.062" dia hole vertically, 0.09" (2.5mm) back from the front edge of the centre fuselage, 0.06" (1.5mm) to the port side of the pylon.

4. **(Decision Required)** All US built and some early Westland built S51s were fitted with the simple lower aft rear fuselage. Most RN Dragonflies (late HR 1s and all HR3s, apparently ... check your references to confirm) had an extended rear fuselage, looking a little like a baby with full diapers. Both parts are provided. Glue on the rear fuselage, and use a flat file to true up the mating surface for the tail boom.

5. Glue on the tailboom.

6. Scribe and/or cut the main gear strut from the pour sprue, and clean up the trailing edge. Glue it in the slot under the centre section. Cut 2 pieces of the 0.060" dia rod supplied to 1.31" (33.5 mm) in length. Wrap thin strips of lead foil or plastic strip around the shaft as shown in Figure 4 to represent the cylinder section of the gear leg. Glue the legs between the angled blocks on the gear struts and the boots on the fuselage side. It is probably best to leave the fitting of the wheels until the end.

7. **(Decision Required)** Westland-built vari-

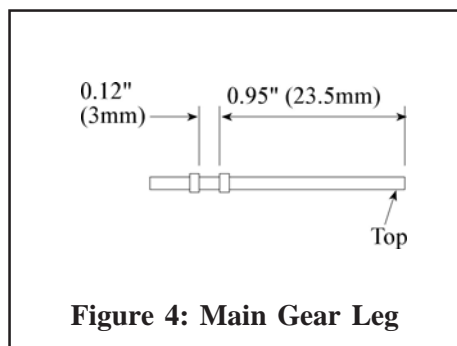


Figure 4: Main Gear Leg

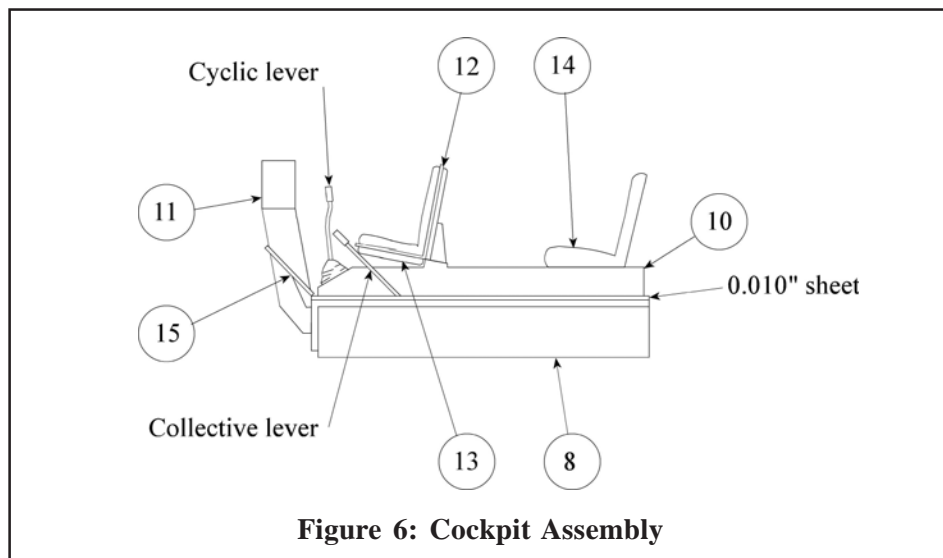


Figure 6: Cockpit Assembly

ants fitted with the Leonides engine had a different exhaust arrangement than Sikorsky built machines. A recess is provided in the port centre fuselage and both exhaust / louvre patterns are provided as separate parts (Figure 3 identifies which is which). Make your choice, sand the backing down and when satisfied with the fit in the recess, glue in place. Note that this part can be installed upside down, so remember the exhaust goes on the bottom. Fill the seam on the top of the insert only.

8. Glue the firewall to the front of the centre fuselage. It should leave a gap at the bottom where the forward fuselage will attach. Note also there is a step formed around the edge of the firewall. This is intended to give the vacuform canopy a positive mounting ledge, so do not try to remove this step.

9. A pre-cast nose weight is provided which fits into a hollow in the forward fuselage. Glue this in place. Cut a floor from the 0.010" sheet plastic provided (use Figure 5 as a template). Glue this in place.

10. Install the centre console, instrument panel and rudder pedals, using Figure 6 as a guide. This is a good time to paint the cockpit interior and instrument panel, before in-

stallation of the forward fuselage. Basic cockpit colour is light grey. The instrument panel structure is either black or light grey with black instrument panel.

11. Sand the pilots seat and seat pan flat and glue the pan under the pilots seat. Paint the seat frame and back interior colour, the seat cushions leather. The pilots seat is attached to the small angled block on the centre console. Add seat belts from lead foil or tape if you wish.

12. Construct a cyclic lever from 0.020" plastic rod according to Figure 6. Glue it in place, installed in the boot moulded to the front of the centre console. The collective lever is also made from plastic rod, installed at a 45 degree angle beside the pilots seat. Note that this is well before the HOTAS era; the stick handles are very simple (à la bicycle grips).

13. Attach the forward fuselage section. Fill the seam underneath, prime and check for flaws.

14. The rear seat can be glued to the centre console, with the back touching the firewall. Add seat belts from lead foil or tape if you wish. Some military machines had a sling-type seat installed instead. You may be able to modify the seats from an ESCI / AMT UH-1D if you want to try this option.

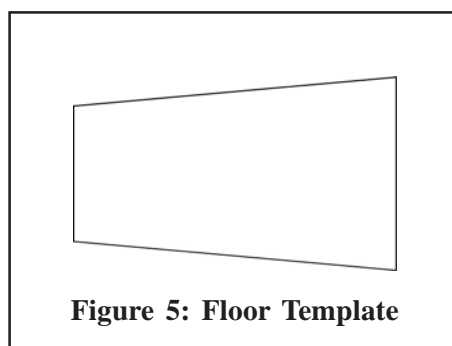
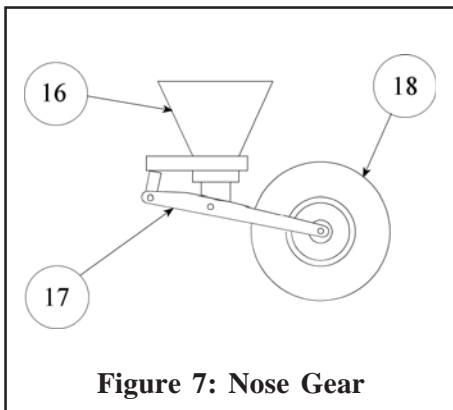


Figure 5: Floor Template

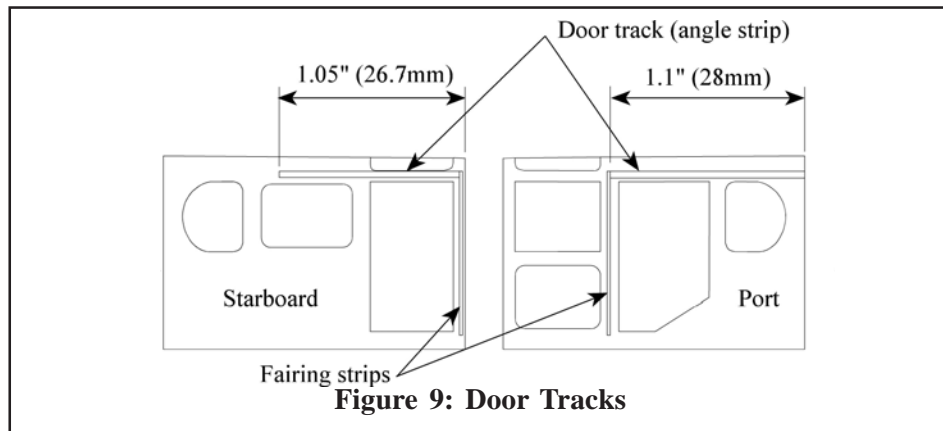


**Figure 7: Nose Gear**

15. **(Decision required)** The S51 nose gear can pivot so it need not be glued on lined up fore and aft. The square link on the bottom of the nose gear strut is the front. Glue the strut to the spot indicated on the bottom of the forward fuselage. The nose gear trailing arm assembly can then be glued to the bottom of the nose gear mount; the top of the link attaches to front of the nose gear mount (see Figure 7). While the arm assembly is designed so the nose wheel can be glued in place, it would probably be stronger to make an axle from steel wire, passing through the arms and the wheel. Leave this step to the end.

16. **(Decision required)** Cut the clear parts out using sharp scissors. There are two forward sections, one standard with lower clear areas and one with two searchlights moulded into the lower section, as seen on some USCG and RCAF versions. Check your references.

Note that the two side pieces have a step moulded into their forward face. This is to provide a better joint for the front of the canopy. Trim as shown in Figure 8. Cut out the doorways in the side pieces as shown on Figure 8. The doors for both sides



**Figure 9: Door Tracks**

are moulded separately.

The edges of the front fuselage and the firewall have steps moulded in place into which the edges of the canopy pieces should fit. These will provide a much stronger joint when glued in place. Some careful trimming may be required to get the three canopy pieces to fit. I suggest the two side pieces be test-fit first, then taped together and the front section fit. Any trimming required to get the front to fit perfectly will have to be done on the side pieces, so prepare yourself for a bit of a trail and error, cut and fit episode. Once satisfied that all the pieces will fit well, untape them and proceed to the next step.

17. Each door can be fitted either open or closed. The doors are suspended from a track running above the windows. The track can be represented by gluing on a piece of the angle strip provided, with the open side facing down. The door then sits underneath the overhanging lip. Refer to Figure 9 for dimensions.

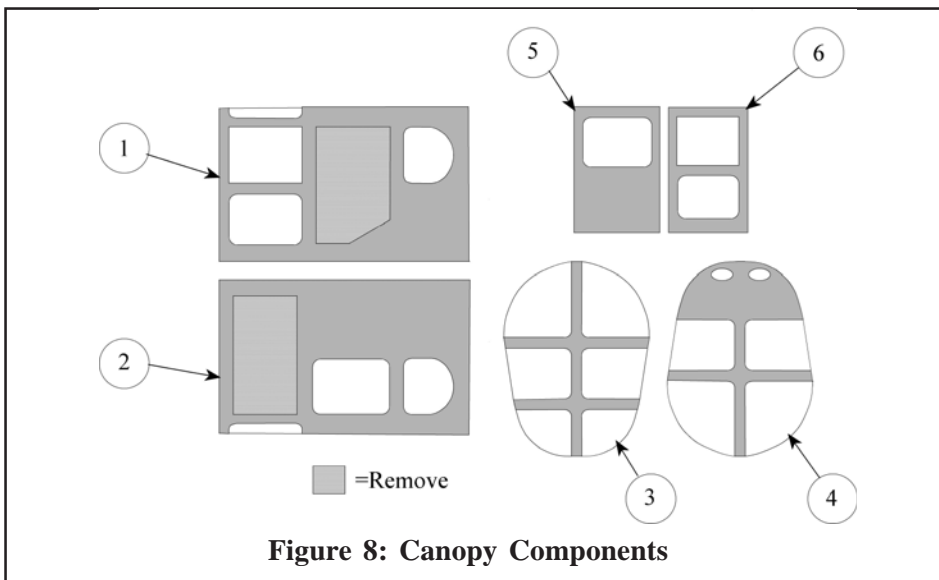
There is also a fairing strip which covers the gap at the front of each door. Cut a piece of 0.030" square strip 1" (25mm) lg,

bend it to match the curve of the side pieces and glue in place. It may be easier to attach the starboard side fairing after the canopy front is glued on and seams filled.

18. Especially if you are mounting the doors open, you may wish to mask and paint the inside of the canopy side pieces. This kit includes a set of EZ Mask pre-cut vinyl canopy masks. The smaller of the two sheets includes masks for the insides of the side windows if you desire. See the bottom for instructions. A coat of clear Future floor wax on the inside of the canopy will aid in clarity as well as protect against fogging due to the fumes from the cyanoacrylate glues.

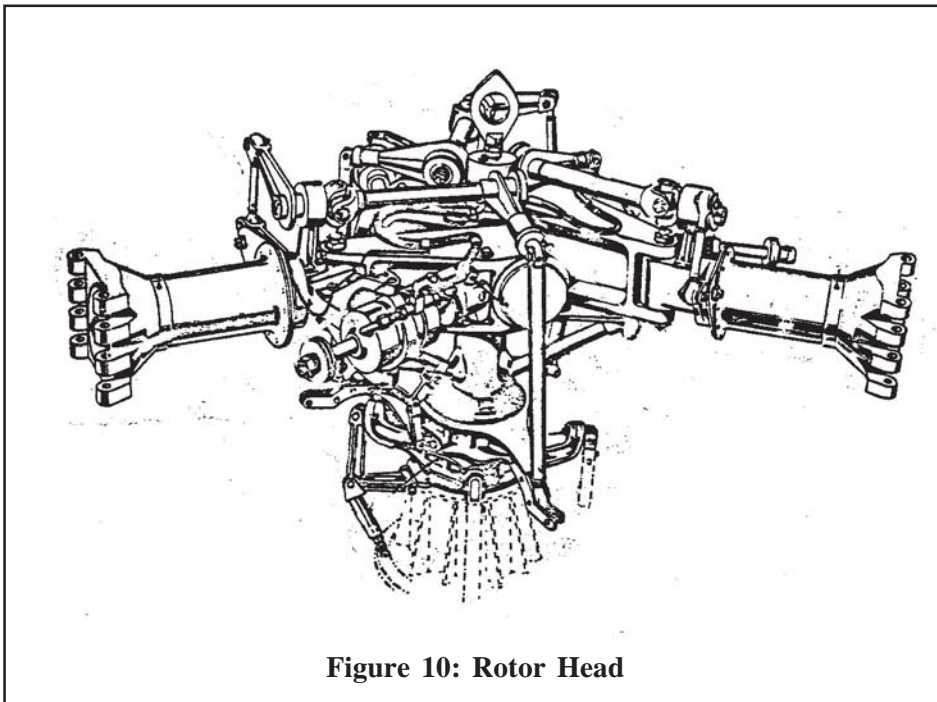
19. The two side pieces can be glued together with a strip of scrap plastic reinforcing the joint underneath. Touch up the paint on the overhead, and then glue the side pieces in place. Glue on the front section. If you mask over the clear areas, you can fill and sand the seams without damaging the windows. The plastic used for the clear parts is not really hard enough to allow polishing.

20. The model can be primed, painted and decalced at this stage. While the paint is drying, the rotary wing and tail rotors can be worked on.



**Figure 8: Canopy Components**

**EZ Mask:** These stick well so the procedure to apply them is to peel them from the backing, dip in water with a bit of detergent added, and manoeuvre them into position using the soapy water as a lubricant. When satisfied they are in position, gently blot them into position. Because the adhesive is tacky and the mask can stretch, it doesn't work well to stick them in place dry and try to peel them off and reposition; the mask will likely stretch and not fit the second time around. Once the model is completely painted, the masks can be removed by lifting a corner with a sharp knife and gently peeling off.



**Figure 10: Rotor Head**

21. The main rotor head is cast in one piece. Some small lengths of stretched sprue will need to be added to represent the pitch control arms as shown in Figure 10. Sand the upper swash plate flat and glue to the bottom of the rotor shaft. Drill a 0.026" hole in the shaft and insert a short length of the steel wire provided. Super detailers may wish to add the oscillation dampers to each arm.

22. In order to give the head/blade joint some strength, I suggest that a 0.026" dia hole be drilled 0.35" (9mm) deep into the arm. A similar depth hole can be drilled in the rotor blade root extension and a length of steel wire cut and glued in place.

23. **(Decision required)** Most early machines had the larger chord wooden blades, while later machines were fitted with narrower metal blades. Check your references.

The thinner metal blades supplied with the kit are so thin that they will bend under their own weight in time. One solution is to scribe a shallow groove in the bottom surface of each blade, glue in a length of fine steel or brass wire using cyanoacrylate glue and fill the seam. Glue the blades in place. Note that the rotary wing turned counter-clockwise when viewed from above.

24. Drill a 0.026" dia hole in the coupling for the tail rotor gear box and insert a length of steel wire so that 0.18" (4.5mm) protrudes. Drill another hole in the rotor end end. The gearbox can be painted natural metal, and glued in place on the shelf at the end of the tailboom. The wire, representing the drive

shaft, should just touch the shaft cover.

25. **(Decision required)** Two bladed tail rotor or three? Check your references. Both types are included in the kit, c/w the appropriate hub. Pick the hub needed and sand flat, drill a 0.026" hole in the rear and insert a short length of steel wire. Glue on the blades (the tail rotor turned clockwise when viewed from the port side. Paint as per instructions. When dry, insert into the hole in the rotor end of the tail rotor gearbox.

26. **(Decision required)** If you chose to use the rescue hoist, some assembly is required. Clean up the flash from the hoist frame (carefully ... the frame is spindly). Sand away the base from the three hoist parts (32-34) and clean up. Glue the hoist reel motor on the port side of the reel. On the other side, glue the reel flange and accumulator in position. Use Figure 11 as a guide. You may want to use some stretched sprue to run a line from the reel to the pulley at the

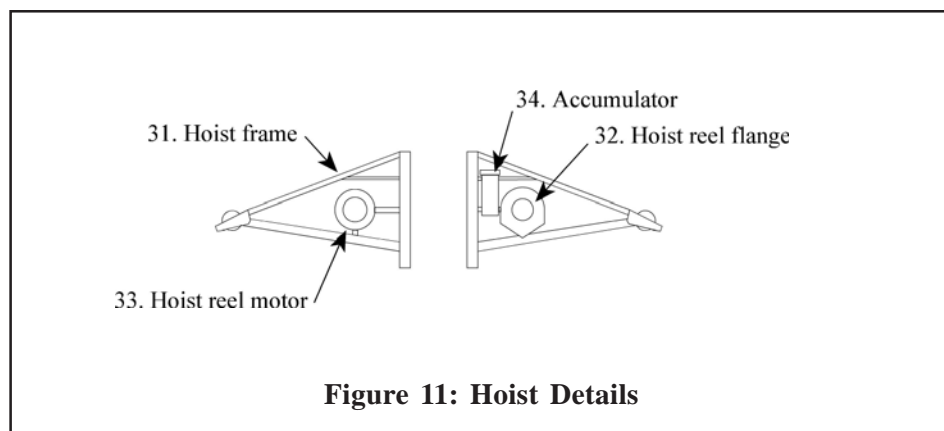
end and down to a hoist hook. Super detailers may wish to add some hydraulic lines as well ... check your references.

The hoist can be painted at this stage. When dry, glue in the pre-drilled hole. Normal position was angled out about 30 degrees, and a brace runs from the end of the hoist to a point just inboard of the top front corner of the port door. Two small braces run from the top of the hoist to the front port side of the pylon front; all these can be made from stretched sprue.

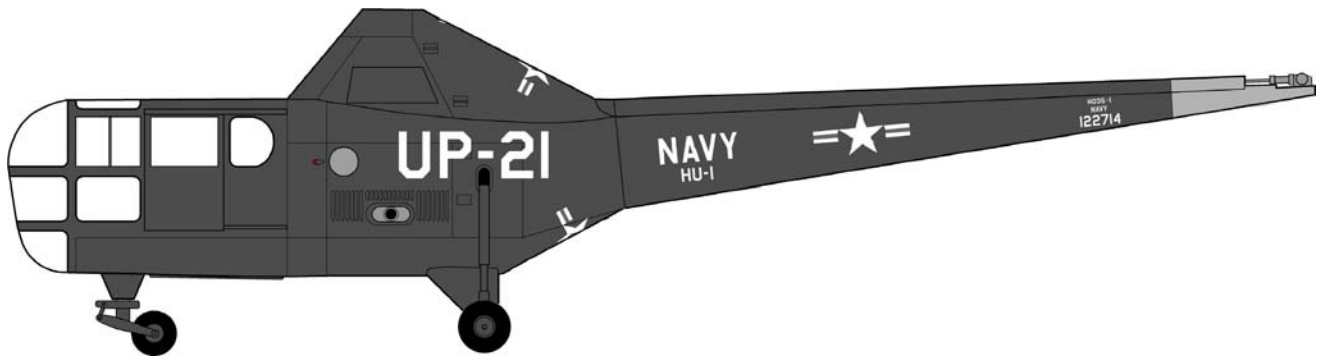
28. Bend steel wire into mounting steps per Figure 1. Drill holes below doors and insert steps, glue in place and touch up paint.

### References

1. Military Helicopters of the World, N. Polmar and F. Kennedy, Naval Institute Press, 1981
2. Civil Helicopters, W. Fowler, Phoebus Publishing, 1980
3. Fly Navy, R. Williams, Airlife, 1989
4. USN/USMC over Korea, T. Doll, Squadron/Signal, 1988
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9. 60 Years: The RCAF and CF Air Command 1924-1984, L. Milberry, Canav Books, 1984
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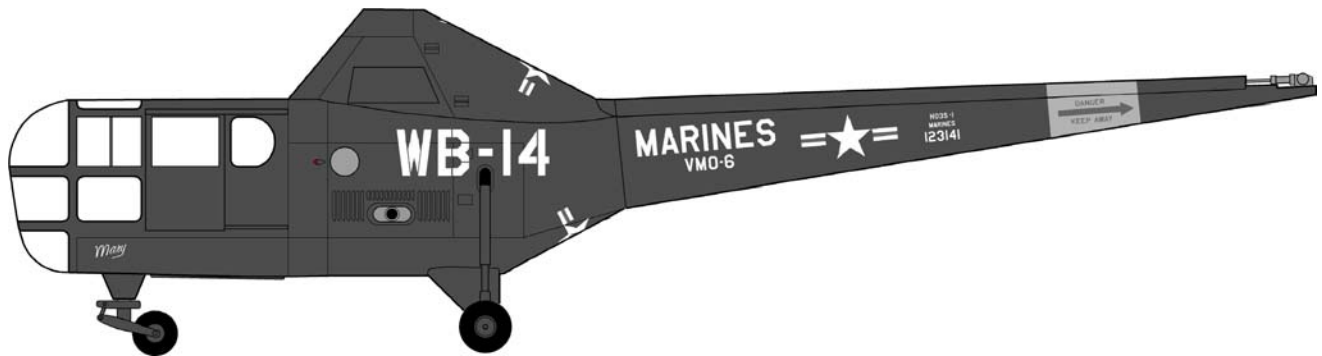
**Figure 11: Hoist Details**



HO3S-1 (BuAer No.122714 / UP-21) HU-1, Korea 1950

Helicopter Utility Squadron HU-1 commissioned in April 1948 and equipped with the Sikorsky HO3S-1. It provided helicopter detachments to fleet carriers for plane-guard duties with one aircraft remaining aloft during launch and recovery operations. Helicopters also provided convenient means for visits to other ships; this machine was photographed on the flight deck of the Royal Navy carrier HMS Glory.

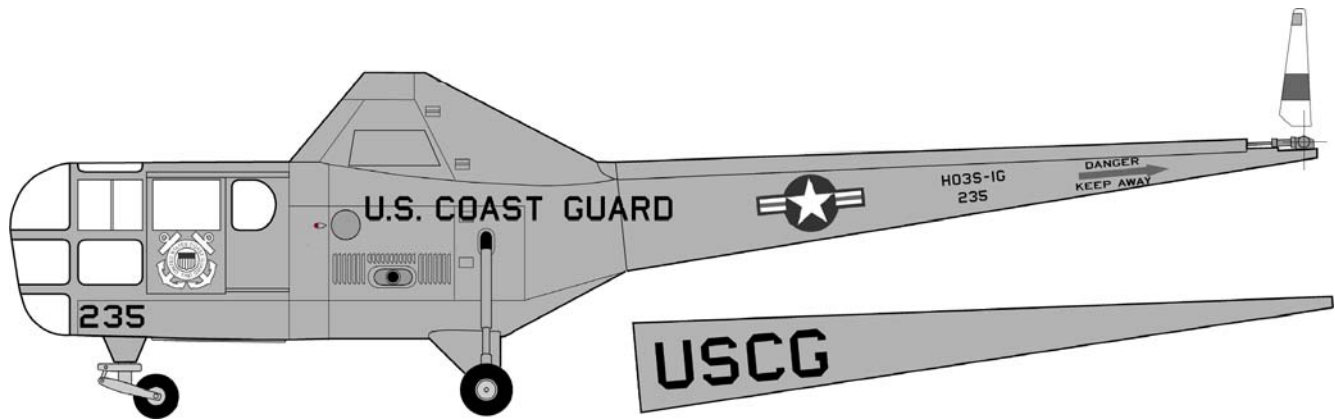
Overall Gloss Sea Blue with yellow tip to tailboom. National insignia is on both sides of the tailboom and above and below the rear fuselage; in the latter two locations, the top point of the star faces forward. Rotor blades are black with yellow tips. Wooden main rotor blades, three bladed tail rotor. Reference: Air War over Korea, p.42.



HO3S-1 (BuAer No.123141 / WB-14) VMO-6, Kimpo, Korea 1950

The HO3S was the first helicopter type operated by the Marines, starting in 1948. It was used for aerial resupply, observation, rescue and medevac missions in the Korean war. Swift evacuation of wounded saved many lives and helped to prove the concept of airborne transportation of casualties to emergency medical facilities.

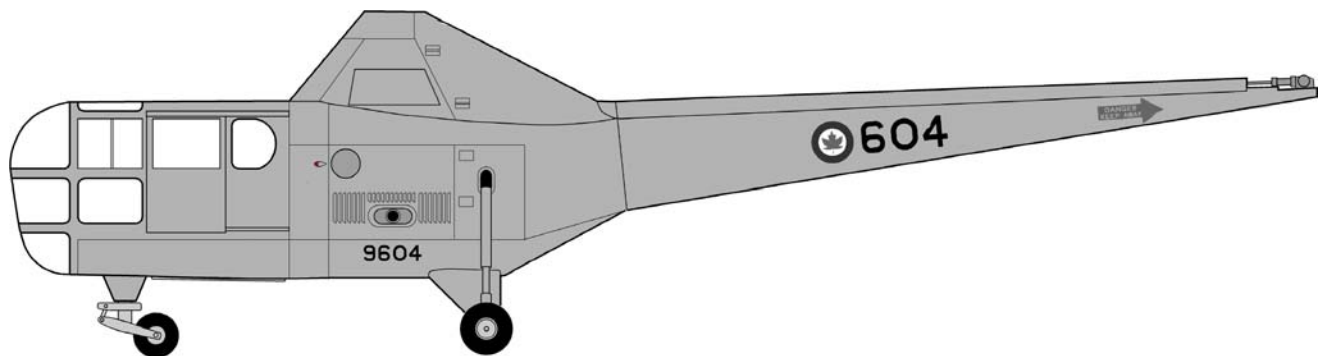
Overall Gloss Sea Blue with yellow band on tail and red tail rotor warning arrow. The name 'Mary' is written in white script below the pilot's door. National insignia is on both sides of the tailboom and above and below the rear fuselage; in the latter two locations, the top point of the star faces forward. Rotor blades are black with yellow tips. Wooden main rotor blades, three bladed tail rotor. Reference: USN/USMC over Korea, p.28.



HO3S-1G (s.n. 235) USCG, 1950

The USCG acquired 9 of the 91 USN HO3S-1s and operated them from 1947-1950. They were used for SAR duties and one feature which was often seen on SAR variants (also seen on USAF and RCAF machines) was twin searchlights mounted in the lower nose.

The markings in the kit represent those worn by the HO3S-1G on display in the US Naval Aviation Museum at Pensacola. It is overall Chrome Yellow. Rotor blades are grey on top, black underneath with yellow tips, tail rotor blades are white with red band and yellow section at trailing edge of tip. Metal main rotor blades, two bladed tail rotor. Reference: Personal photos.

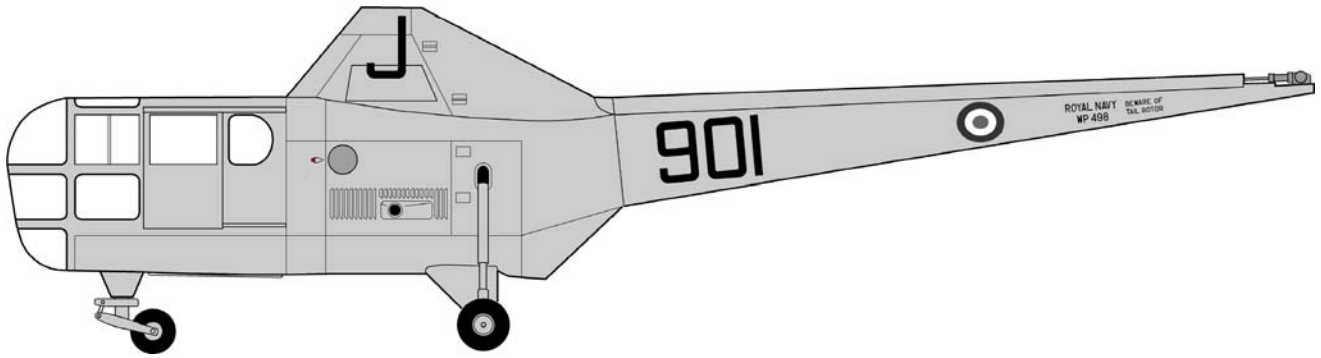


H-5 (s.n. 9604), RCAF, 1955

The Royal Canadian Air Force acquired 7 Sikorsky S51s (civil variant) in 1947, RCAF serials from 9601 to 9607 being assigned. These were the first rotary wing machines operated by the RCAF and were used for survey work and training but primarily SAR. The seven machines were based across the country, serving in the Search and Rescue Units of the RCAF from Greenwood to Cold Lake.

Throughout its long career in the RCAF, the H-5 carried only one scheme; overall yellow. Rotor blades are grey on top, black underneath with yellow tips, tail rotor blades are black with red/white/red tips. When originally delivered in 1947, the H-5 had wooden rotor blades and these were later replaced by metal main rotor blades. However, even early photos indicate a two bladed tail rotor. Reference: RT Vol 13. No.2.

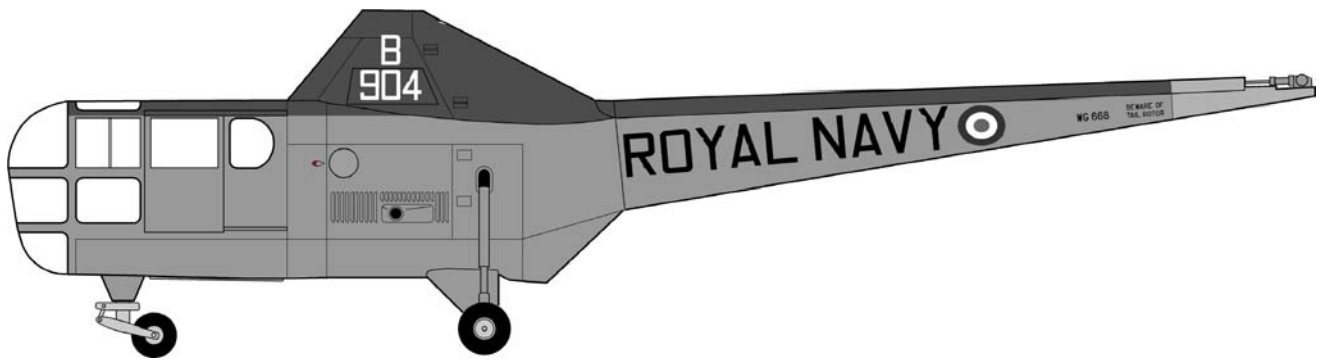




**Dragonfly HR.3 (WP498, 901/J) HMS Eagle, 1954**

Initial delivery of the Westland-built license production of the S51 included 13 to the RN (HR Mk 1, equipped for air-sea rescue with a hoist) and 3 to the RAF (HC Mk 2, equipped for casualty evacuation with stretcher panniers). All HR 1s were delivered in 1950 to 705 Sqn at Gosport who used them for operational trials and training. These early machines had wooden rotor blades which were judged to be unsatisfactory for operational use and the 58 subsequent HR Mk 3 had metal blades. HR 3s were also operated by 701 and 728 Sqns, primarily in the SAR role. The last RN Dragonfly was phased out of service in 1967.

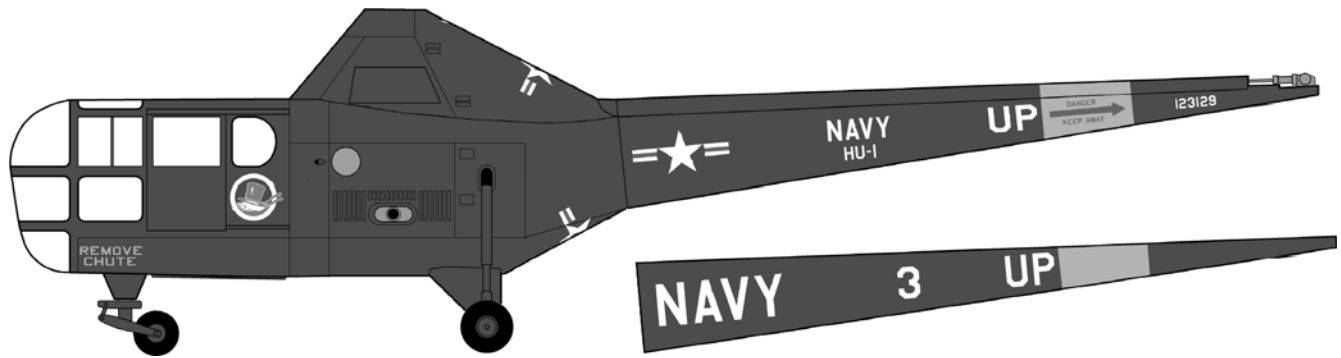
This HR Mk 3 of HMS Eagle's Ships Flight in 1954 is finished in the earliest of three RN schemes, overall aluminum lacquer. Rotor blades are black with yellow tips. Metal main rotor blades, three bladed tail rotor. Reference: Fly Navy, p.43.



**Dragonfly HR.3 (WG668, 904/B) HMS Bulwark, 1955**

This HR Mk 3 of HMS Bulwark's Ships Flight in 1955 is finished in the intermediate RN scheme of Extra Dark Sea Grey over Sky, with a yellow tip to the tailboom. Main rotor blades are black with yellow tips, tail rotors are black with red/white/red tips. Metal main rotor blades, three bladed tail rotor. Reference: British Naval Aircraft since 1912, p.349.

Sometime in the late '50s, RN Dragonflies received their final paint scheme, overall Oxford Blue with white markings. A good photo of this can be found on p.45 of Fly Navy.



HO3S-1 (BuAer 123129 / UP-3) as seen in the film 'The Bridges at Toko-ri'

If you haven't seen this film, you should. It's a good story and full of tremendous flying footage of F9F Panthers and of course, the HO3S. The combat scenes are shot with models but they are done very well. Chief AP pilot Mike Forney (played by Mickey Rooney) is an irrepressible sort who wears a green top hat and scarf while flying his plane guard duties. At the end, Forney is shot down while trying to rescue VF-192 pilot Lt. Brubaker (William Holden) from behind enemy lines and they are both are shot dead in a muddy ditch ... hardly a fitting end for a naval aviator or heroic rescue pilot.

Close examination of the film shows that more than one helicopter was used, but the markings with the kit are based on photos of the machine used in the final scenes. These markings are sort of a mix of authentic markings from different time periods. The machine is overall Gloss Sea Blue with a yellow band on the tail boom and red danger markings. Stars and bars are in standard positions. The squadron letters (UP) are just forward of the yellow band and are repeated under the tailboom. The aircraft number (3) is only shown under the tailboom along with a large NAVY; both these last markings are non-standard. Under the pilot's door is the instruction REMOVE CHUTE in yellow. Finally, there is the logo of Mike Forney's machine, a green top hat and scarf. This was seen on both sides of the aircraft, but in at least one shot, was missing from the starboard side. To go along with these markings, the kit also includes a figure of Mike Forney, complete with scarf and top hat. The figure was sculpted specially for this kit and sports authentic Korean War vintage flying gear on a five-foot nuthin frame. Flying coveralls are light khaki, boots are black and life jacket is yellow. Scarf and top hat are bright green.

References for the movie markings are, of course, the film and the Summer 1982 issue of 'The Hook' which includes a fascinating history of combat rescue, including the two incidents on which the story of 'The Bridges of Toko-ri' was based.

#### Thanks

*Special thanks to Michel Davignon who sculpted the figure of Mickey Rooney, to Jamie Leggo for photography and to Sherman Collings who provided encouragement, advice on casting and loaned me his photos of the HO3S-1G after mine turned out to be such a failure.*

*I would further like to thank Chris Loney of EZ Masks who came up with the idea for pre-cut canopy masks well before all his imitators, and who still makes the best masks on the market. Use them ... I do!*

*I would like to devote this kit to the memory of Mr. Jack Charleson, the first civil registered helicopter pilot in Canada and long time chief pilot for the Department of Transport, whose talk on early rotary wing aviation in Canada got me interested in helicopters in general and the Sikorsky S51 in particular. If only someone could tell me what colour CF-DOY (below) was!*

