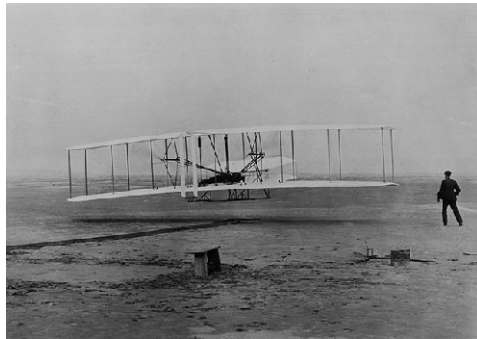




Historic Wings

1:72 Metal Kit of the



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1903 Wright Flyer 1

History, Notes and
Assembly Instructions

History

On December 17, 1903, the Wright brothers made the first successful controlled flight of a heavier-than-air flying machine at Kitty Hawk, North Carolina. This aircraft, known as the Wright Flyer, was the result of a four-year long program of research and development conducted by Wilbur and Orville Wright beginning in 1899. The Wright brothers had a passing interest in flight as youngsters. In 1878 their father gave the Wright brothers a toy flying helicopter model powered by strands of twisted rubber. They played with it extensively and built several larger copies of the model. They also experimented with kites. But not until the fatal crash of glider pioneer Otto Lilienthal in 1906, did the Wrights begin to study flight seriously. In the summer of 1899 the Wright brothers built their first aircraft - a five-foot-wingspan biplane kite. The Wrights followed Lilienthal's lead of using gliders as a stepping stone towards a practical powered airplane. The 1899 kite was built to verify their proposed system of control. This meant that control would be a central feature of the later successful powered airplane.

Instead of shifting the pilot's body weight to control the aircraft by altering the centre of gravity by, as Lilienthal had done, the Wrights intended to balance their glider aerodynamically. Their reasoning was that if a wing generates lift when presented to an oncoming flow of air, producing differing amounts of lift on either end of the wing would cause one side to rise more than the other, which in turn would bank the entire aircraft. A mechanical means of inducing this differential lift would provide the pilot with effective lateral control of the airplane. The Wrights accomplished this by twisting, or warping, the tips of the wings in opposite directions through a series of lines attached to the outer edges of the wings that were manipulated by the pilot. This was significant because it provided an effective method of controlling an airplane in three-dimensional space and, because it was aerodynamically based, it did not limit the size of the aircraft as did shifting body weight. The satisfactory performance of the 1899 kite proved the wing warping control system. Encouraged by the success of their small wing warping kite, the brothers built and flew two full-size piloted gliders in 1900 and 1901.

The Wrights' home of Dayton, Ohio, did not offer suitable conditions for flying the gliders. An inquiry to the U.S. Weather Bureau identified Kitty Hawk, North Carolina, with its sandy, wide-open spaces and strong, steady winds as an ideal test site. In September 1900, the Wrights made their first trip to the little fishing hamlet that they would make world famous.

The Wrights' third glider, built in 1902 based on the wind tunnel experiments, was a dramatic success. Lift problems had been solved, and with a few refinements to the control system (the key one being a movable vertical tail), they were able to make numerous extended controlled glides. They made between seven hundred and one thousand flights in 1902. The single best one was 622½ feet in twenty-six seconds. The brothers were now convinced that they stood at the threshold of realizing mechanical flight.

During the spring and summer of 1903 they built their first powered airplane. This was a larger and stronger version of the 1902 glider, the only fundamentally new component being the propulsion system. With the assistance of their bicycle shop mechanic, Charles Taylor, the Wrights built a small, twelve-horsepower petrol engine. While the engine was a significant achievement, the genuinely innovative feature of the propulsion system was the propellers. The brothers considered each propeller as rotary wings, which produced force aerodynamically. By turning an airfoil section on its side and spinning it to create an air flow over the surface, the Wrights reasoned that a horizontal "lift" force would be generated that would propel the airplane forward.

By autumn 1903, the powered airplane was ready for trial. A number of problems with the engine transmission system delayed the first flight attempt until mid-December. After winning the toss of a coin to determine which brother would make the first try, Wilbur took the pilot's position and made an unsuccessful attempt on December 14th, damaging the Flyer slightly. Repairs were completed and a second attempt was made on December 17. It was now Orville's turn. At 10:35 a.m. the Flyer lifted off the beach at Kitty Hawk for a twelve-second flight, traveling 120 feet (37 meters). Three more flights were made that morning, with the brothers alternating as pilot. With Wilbur at the controls, the fourth and last flight covered 852 feet (260 meters) in 59 seconds. With this final long flight, there was no question that the Wrights had flown.

As the brothers and the others present discussed the long flight, a gust of wind overturned the Wright Flyer and sent it tumbling across the sand. The aircraft was severely damaged and never flown again. But the Wrights had achieved what they had set out to do. They had successfully demonstrated their design for a heavier-than-air flying machine.

Design :

The 1903 Wright Flyer was built from spruce and ash timber, and was covered with muslin. The framework "floated" in pockets sewn into the muslin covering, which made it an integral part of the structure. This ingenious feature made the aircraft light, strong, and flexible. The aircraft was powered by a simple four-cylinder engine of the Wright brothers own design.

Wingspan: 40 ft 4 in (12.3 m)

Length: 21 ft (6.4 m)

Height: 9 ft 3 in (2.8 m)

Weight, empty: 605 lb (274 kg)

Power plant: 12 horsepower 4-stroke petrol engine, driven two contr-rotating propellers

Introduction

This Historic Wings kit is made from etched brass for the main structure, with cast metal detail parts. The flying surfaces can be covered with the tissue paper supplied, although many modellers may prefer to leave the structure uncovered to show the details.

Brass components can be soldered together, or joined with cyanoacrylate (SuperGlue) or 5-minute epoxy. If you have the skills and equipment we recommend soldering.

To remove parts from the etched fret, you can use a pair of side cutters, or put the fret on a ceramic tile, and press down on each attaching tab with a sharp knife. If you use the 'knife & tile' option, put the attaching tab with the half-etched side of the tab face down. Whichever method is used, it is necessary to remove the burr of the attachment tab with a needle file afterwards.

CAUTION - MAKE SURE THE ORIENTATION OF THE WING IS CORRECT BEFORE YOU TWIST EACH RIB. IF IT IS WRONG, YOU WILL HAVE THE ENGINE ON THE LEFT SIDE, NOT THE RIGHT.

The wings and elevators are etched with integral ribs. Hold the leading or trailing edge in a vice or clamp, and then hold each rib in turn with a pair of fine flat-nosed pliers, and twist that rib through 90 degrees. When all the ribs have been turned, clamp the trailing edge, and do the process again.

Where etched parts are joined with two inter-locking slots it may be necessary to enlarge a slot with a needle file. This is because photo-etching is not an exact process, and sometimes the etching is slightly uneven across a sheet.

Parts List

Etched Brass

Fret 1 1 off
Fret 2 1 off

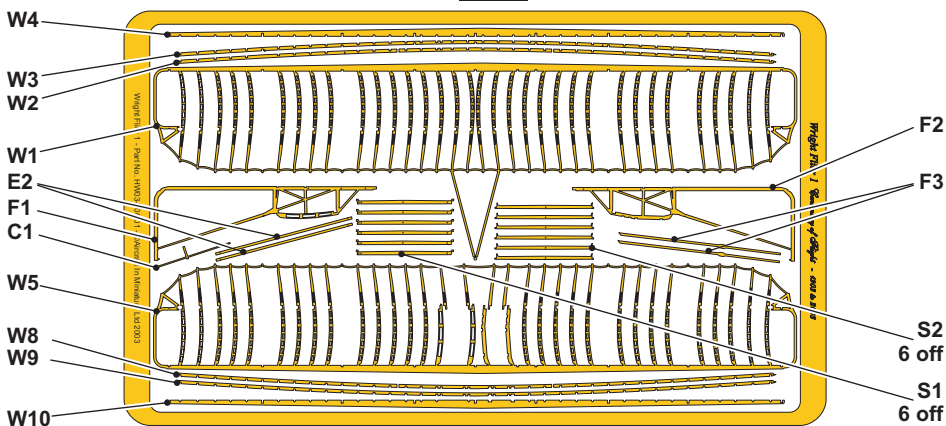
Cast Metal

Engine 1 off
Figure - Orville Wright 1 off
Figure - Wilbur Wright 1 off
Fuel tank 1 off
Generator 1 off
Instrument cluster 1 off
Propeller (1 x left, 1 x right) . . . 2 off
Radiator 1 off

Miscellaneous

Instructions 1 set
Tissue paper 1 sheet

Fret 1

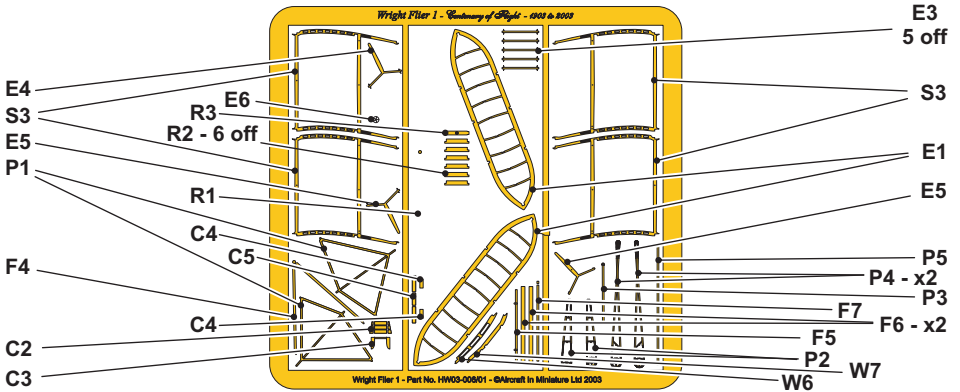


C 1 Elevator control
E2 Elevator spar (x2)
F1 Fuselage frame - left
F2 Fuselage frame - right
F3 Fuselage brace (x2)

S1 . Strut, interplane-forward (x6)
S2 Strut, interplane - aft (x6)
W1 Wing - top
W2 Wing spar - top, forward
W3 Wing spar - top, aft

W4 Wing - top, leading edge
W5 Wing - bottom
W8 Wing spar - bottom fwd.
W9 Wing spar - bottom aft
W10 Wing - bottom, leading edge

Fret 2



C2 ... Foot cradle body
 C3 ... Foot cradle top & sides
 C4 ... Body cradle side (x2)
 C5 ... Body cradle base
 E1 ... Elevator (x2)

E3 ... Elevator strut (x5)
 E4 ... Elevator pivot - drive
 E5 ... Elevator pivot (x2)
 E6 ... Elevator drive gear
 F4 ... Rudder support
 F5 ... Fuselage spar
 F6 ... Fuselage spar (x2)

F7 ... Fuselage spar - long
 P1 ... Propeller mounting (x2)
 P2 ... Chain drive - short (x2)
 P3 ... Brace - short
 P4 ... Chain drive - short (x2)
 P5 ... Brace - long
 R1 ... Rudder structure
 R2 ... Rudder strut (x6)
 R3 ... Rudder mounting
 S3 ... Interplane strut & ribs (x4)
 W6 ... Rib - pilot support
 W7 ... Rib - engine support

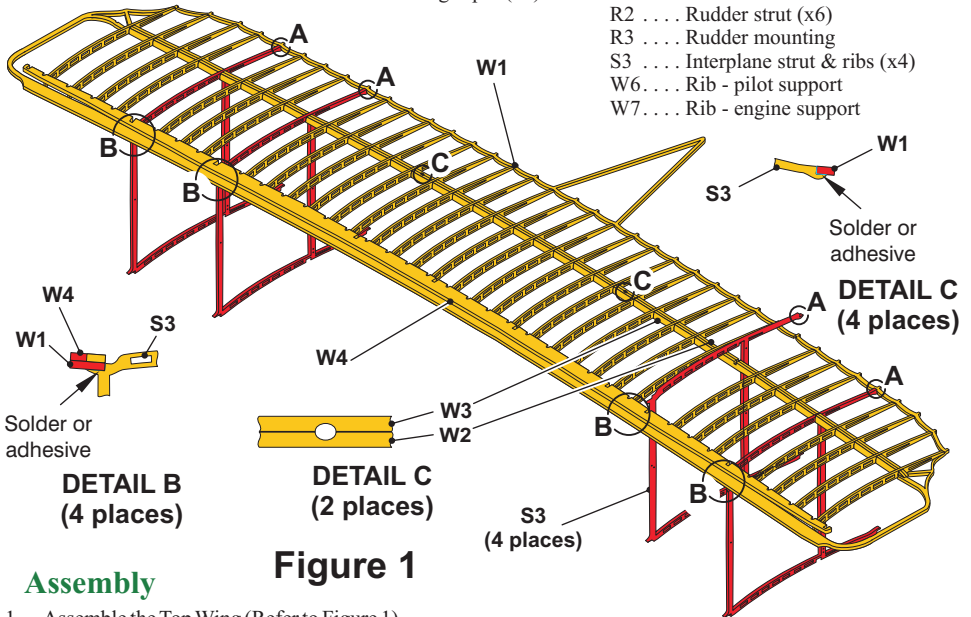


Figure 1

Assembly

1 Assemble the Top Wing (Refer to Figure 1)

A Turn the ribs through 90 degrees.

(1) **CAUTION** - MAKE SURE THAT THE ORIENTATION OF THE WING IS CORRECT BEFORE YOU TWIST THE RIBS.

Clamp the leading edge of the wing (W1) so that you can only see the ribs.

(2) Twist each rib through 90 degrees.

- 4 Assemble the rudders (Refer to Figure 4)
- A Fold the rudder structure (Refer to Figure 4, Detail A)
- NOTE - The fold lines are on the lower face before the item is folded, so they are inside the structure after it is folded.
- B Attach the six rudder struts (R2), and the rudder mounting (R3).

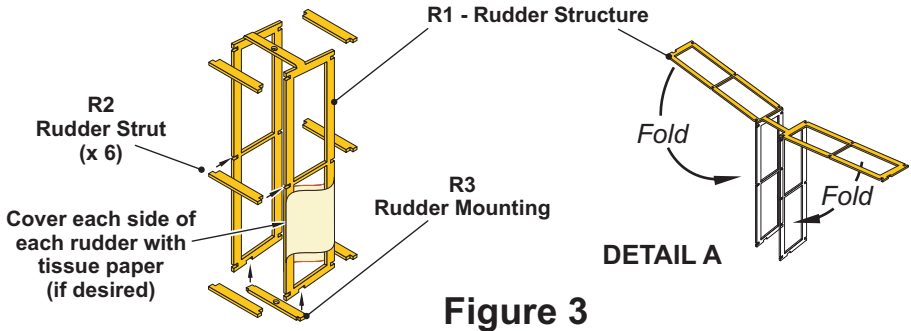


Figure 3

- 5 Assemble the Elevators (Refer to Figure 4)
- A Assemble the components.
- (1) Turn the ribs of the first elevator through 90 degrees.
- (a) Turn the ribs.
- 1 Clamp the leading edge of one elevator (E1) so that you can only see the ribs.
 - 2 Twist each rib through 90 degrees, adjacent to the clamp.

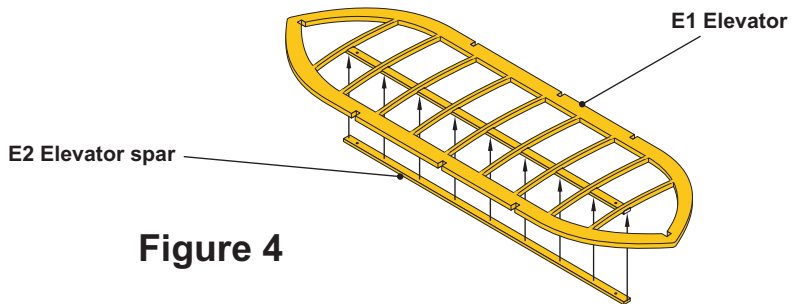


Figure 4

- 3 Remove the leading edge from the clamp, and then clamp the trailing edge so that you can only see the ribs.
 - 4 If necessary, remove any ripples in the ribs, so that each rib is flat, and parallel to the adjacent ribs.
- (b) Attach the spar (E2) below the ribs of the elevator.
- (2) Do steps (1)(a)1 thru (1)(b) for the second elevator.

6 Cover each of the flying surfaces with tissue paper (if required - Refer to Figure 5).

A Cover a flying surface

NOTES: 1 - An elevator is illustrated, but the same procedure is used for all the flying surfaces.

2 - The flying surfaces are the two wings, the two elevators and the rudder.

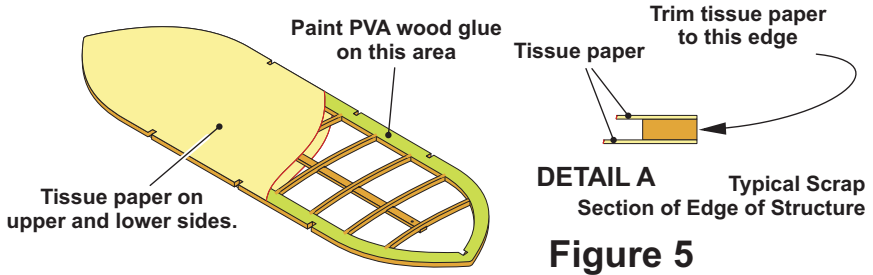
(1) Paint the structure.

1 De-grease the structure. Hold it with tweezers, and dip it in cellulose thinners, methyl ethyl ketone (MEK), or your preferred degreasing agent, to remove any grease. Do not touch it with your fingers again before it is painted

2 Paint the structure a light tan or cream (to simulate a light coloured wood).

3 Let the paint dry.

B Paint the area shown in Figure 6 with PVA wood glue .



C Cut a piece of tissue paper which is larger than the structure, lay it in place, and press the tissue paper on to the wood glue.

D When the wood glue is dry, turn the structure over and do steps 7 A thru 7 C to apply tissue paper to the second side of the structure.

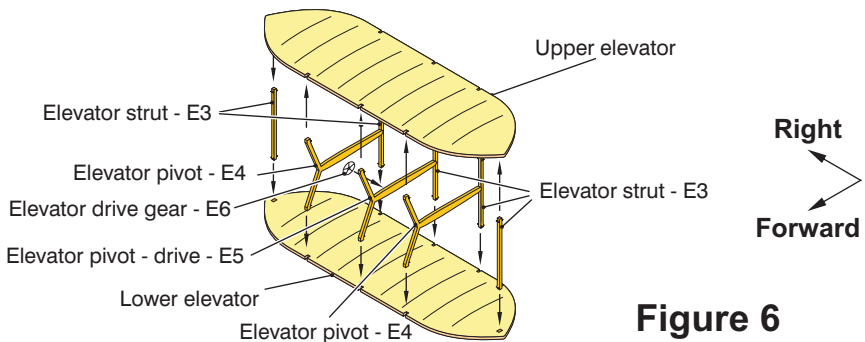
E Use a very sharp knife to trim the paper to the edge of the structure (see Detail A of Figure 6).

F Do steps 7 A thru 7 E to each of the other flying surfaces.

7 Assemble the Elevator (Refer to Figure 6).

A Attach the components to the lower elevator.

(1) Attach the five elevator struts (E3), and make sure they are vertical.



(2) Align the elevator drive gear (E6) with the etched guide lines (on the right side of the elevator pivot - drive (E5)), and attach it to the elevator pivot - drive.

(3) Attach the elevator pivot - drives (E5 - x2) to the elevator.

B Attach the upper elevator to the struts and elevator drives.

8 Assemble the wings, elevators and rudders to the fuselage (Refer to Figure 7) .

A Attach the wings to the fuselage frames.

- (1) Attach the rib doubler of the left fuselage frame (F1) to the inboard face of the outboard pilot support rib of the lower wing.
- (2) Attach the rib doubler of the right fuselage frame (F2) to the inboard face of the outboard engine support rib of the lower wing.
- (3) Attach the rib doubler (W6) to the outboard face of the inboard pilot support rib of the lower wing.
- (4) Attach the rib doubler (W7) to the outboard face of the inboard engine support rib of the lower wing.
- (5) Attach the two fuselage spars (F6) to the two skids of the fuselage frames.

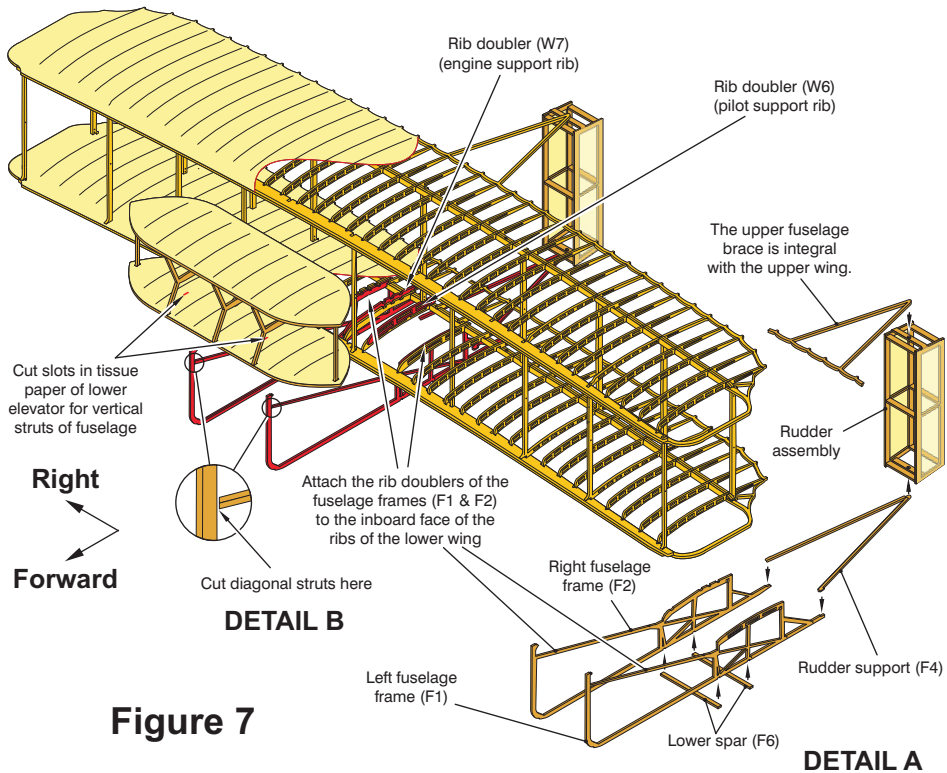


Figure 7

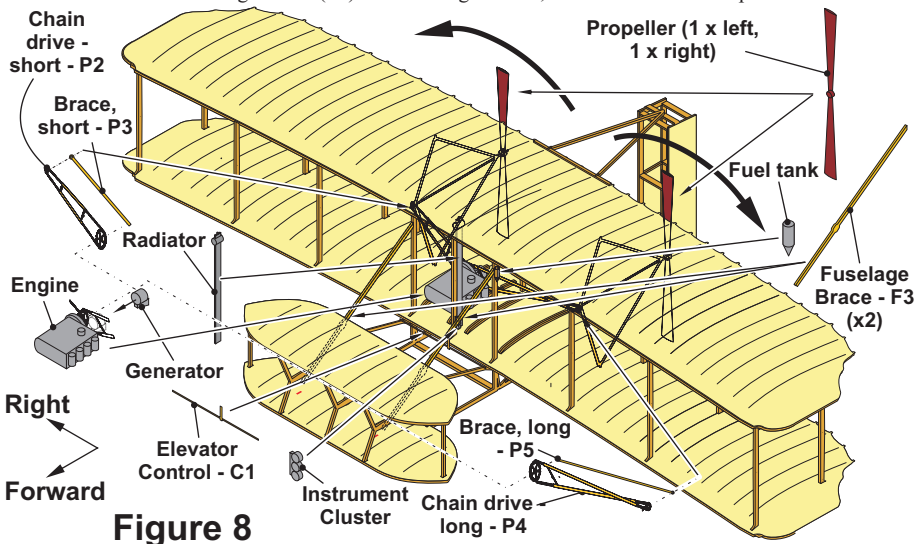
B Attach the elevator to the fuselage frames (Refer to Figure 7, Detail B).

- (1) Cut diagonal struts here, to release them from the vertical strut.
- (2) Carefully bend each diagonal strut away until it is possible to slide the elevator onto the vertical struts of the fuselage.
- (3) Slide the lower elevator over the vertical struts of the fuselage frames, and attach these vertical struts to the spar of the upper elevator with 5-minute epoxy adhesive.
- (4) Bend the diagonal struts back to their original positions, and fill the cuts with 5-minute epoxy adhesive.

C Install the rudder assembly

- (1) Attach the rudder support (F4) to the skids of the two fuselage frames.
- (2) Fit the rudder assembly between the upper and lower fuselage braces, and attach it.

- 9 Attach the detail parts (Refer to Figure 8)
 - A Drill 0.018 inch (0.45 mm) diameter holes in the hub of each propeller, and in the braces (P3 and P5) and chain drives (P2 and P4) - (where they fit on to the propeller supports).
 - B Attach the radiator and instrument cluster to the centre, forward interplane strut.
 - C Attach the fuel tank to the left, inboard, forward interplane strut.
 - D Install the engine, chain drives, and propellers.
 - (1) Put the feet on the bottom of the engine in the slots of each engine support rib, and attach the engine to the lower wing.
 - (2) Use the holes drilled in step 9 A, and put the braces (P3 and P5) and chain drives (P2 and P4) on to the propeller supports. At the same time, attach them to the flywheel on the back face of the engine.
 - (3) Attach the generator to the outboard engine support rib, with the generator touching the gear wheel of the chain drives.
 - (4) Use the holes drilled in step 9 A, and attach the propellers.
 - E Attach the elevator control (C1) between the fuselage frames.
 - F Attach the two fuselage braces (F3) to the fuselage frames, and to the inboard interplane struts.



- 10 Paint the details as shown on the drawing in the centre page of these instructions.
- 11 Paint the two figures supplied. We have no specific information, but all photographs seem to show the two brothers wearing dark jackets or waistcoats, with white or light coloured shirts. Faces and hands should be pink or 'flesh'.
- 12 Lay the prone figure on the lower wing, and stand the second figure where required.

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