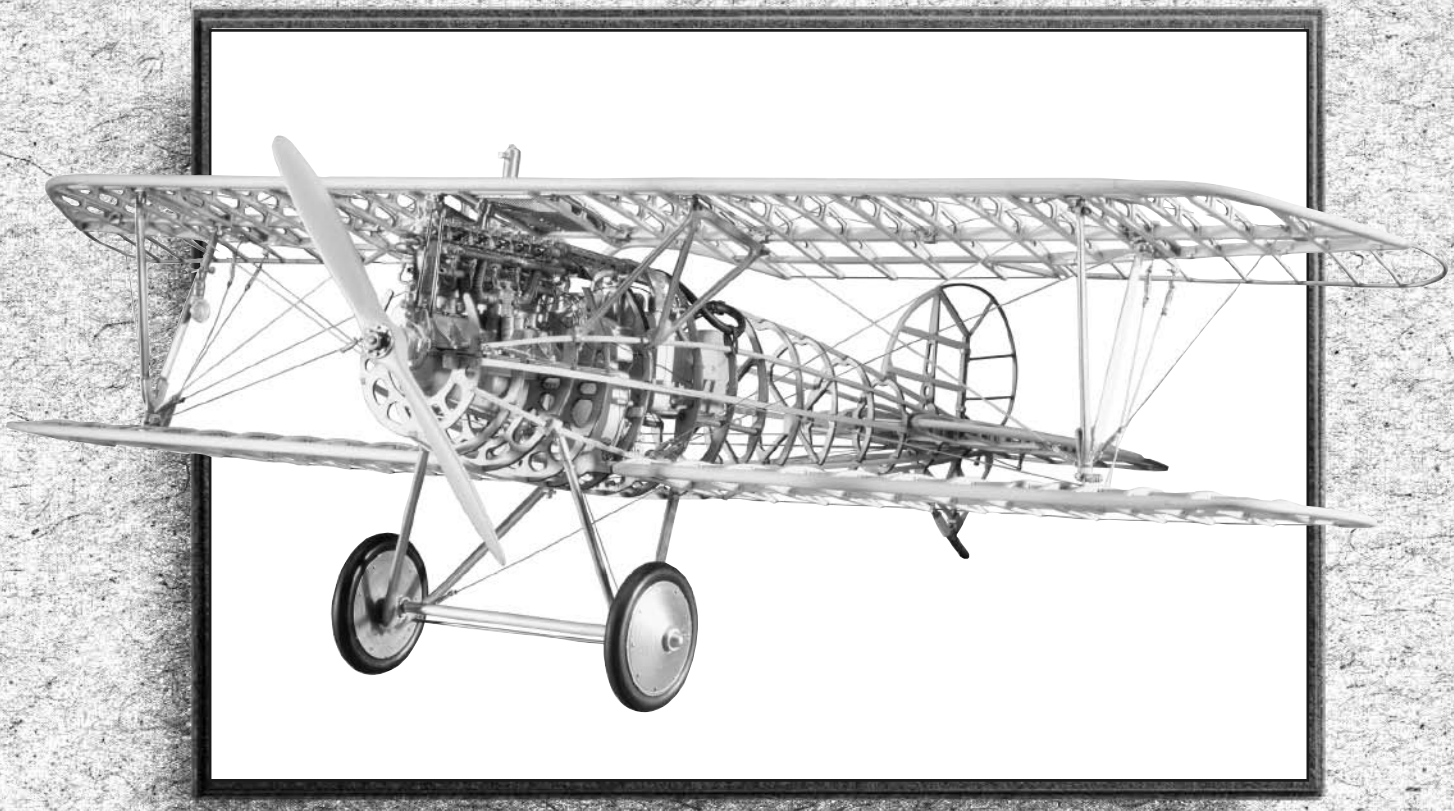
INSTRUCTION MANUAL

ALBATROS D.Va



WORLD WAR I GERMAN FIGHTER AIRCRAFT

1:16 SCALE
Wingspan: 572 mm (22-1/2")
Fuselage: 463 mm(18-1/4")
No. MA1001

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ALBATROS D.Va

INSTRUCTION MANUAL PREPARED BY BEN LANKFORD, 1997

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Fuselage Length: 463 mm (18-1/4 inches)

History

The ALBATROS was manufactured by Albatros Werke, in Johannisthal, Germany near Berlin. The first aircraft of a series, the ALBATROS D.I first saw combat on September 17, 1916. Soon the ALBATROS proved its worth, successfully defeating seven British FE.2b Pusher aircraft. These stunning victories immediately made other fighter aircraft obsolete, and the Albatros class soon became the backbone of the German air service.

The D.V was a two wing, single seat aircraft, joining the ranks in 1917. Unfortunately, the D.V proved to have some structural problems with its lower wing, making it difficult to maneuver at times. The D.Va was then introduced, which was basically the same aircraft as the D.V, with some added structural modifications. The D.Va had a wingspan of 9.05 meters (29' 8-1/4"), length of 7.33 meters (24' 1/2"), and attained a speed of 186 km/hour (115.5 mph). It was powered by a 180 HP Mercedes 6 cylinder engine. It carried two Spandau machine guns, making it a formidable foe to the existing fighter planes of its day. More than 1,050 planes were operational in 1918, making it one of the highest production airplanes of the entire war. It was about this time, the Werke company had switched over to producing another famous German fighter, the Fokker D.VII.

The ALBATROS developed from the D.I to the D.XII, and continued after World War I into Polish and Czech units. Two aircraft are known to remain today, both D.Va's. One is in the National Air and Space Museum, Washington, DC, in the United States, and the other one is in Australia.

Plans of these aircraft are well documented. One source is Scale Aircraft Drawings, Volume 1, published by Model Airplane News. The drawings were prepared by W.A.Wylam. Also, these craft are documented in Jane's Encyclopedia of Aviation, and many other books on World War I aircraft.

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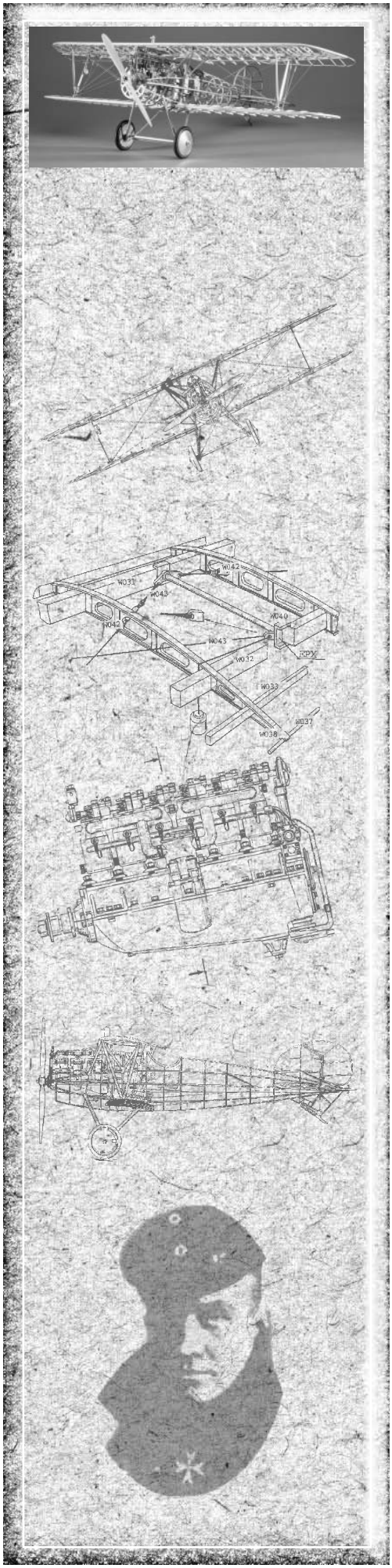


WORLD WAR I GERMAN FIGHTER AIRCRAFT

ALBATROS D.Va

Model plans and original Instructions in Italian were developed by Luigi Volonte. Text rewritten in English and expanded by Ben Lankford 1997. Model built by Larry Edwards

The Model Expo plans and kit were completed in 1997. The kit was designed for Model Expo, Inc. by Microfusioni - modellisimo, owned by Luigi Volonte' and son Bruno. Luigi is a former World War II fighter pilot. The firm is located in Rome, Italy. Castings for the kit were also produced by the Italian firm. Laser-cut wooden parts were made, and the kit is produced and assembled by Model Expo, Inc. in Hollywood, Florida, U.S.A..

Model Expo, Inc.
Hollywood, Florida

Before You Begin

The ALBATROS is a very interesting aircraft and makes a splendid model. The kit is intended as a structural model without covering. Nearly every detail of the real aircraft has been included as scale permitted.

The kit is supplied with a set of britannia metal castings and laser-cut wooden parts, making the kit unique and easy to assemble. The britannia castings are of excellent quality, and will require some final finishing before they are suitable for installation on the model. This will be discussed later.

If you are a beginner, take your time. This model has a fair amount of detail and small parts. Make sure you complete one stage before moving to the next. And don't worry about repeating a step.

How To Work With The Plans & Parts

Before starting construction on your model, examine the kit and study the plans and sketches carefully. Familiarizing yourself with the kit will help you determine that all parts have been supplied as listed. You'll also be surprised at just how quickly handling the parts allows you to better understand the kit requirements. Try to visualize how every part will look on the completed model, also, determining ahead of time, what must be done first. The instructions will help you in this regard, but a thorough knowledge of the plans and sketches at the outset is essential.

In order to locate small fittings and hardware, and to prevent against loss or damage of these parts, it is highly recommended that this material be kept in appropriately marked storage bags/boxes until they are used.

Plans

6 Plan Sheets are provided:

1.DM01 - Mercedes 180 HP Motor
(contained in the manual)
2.D001 - Overall Aircraft View
3.D002 - Fuselage - Ribs - Stabilizer
4.D003 - Upper and Lower Wing
5.D004 - Complete Fuselage Assembly
6.D005 - Laser-Cut Wood Patterns:
Building Jig and Stands

In addition, a set of sketches appears throughout this instruction manual to further illustrate the various stages of construction.

The ALBATROS kit is manufactured to a scale of 1:16. Each plan sheet is drawn to the exact scale that the model is to be built, except for some sketches which have been enlarged for clarity. Where necessary, dimensions can be lifted directly off the plans by using a set of draftsman dividers or by using a "tick" strip, which is simply a piece of paper used to "pick-up" the dimensions (a roll of calculator tape works very well). Lay your paper strip over the plan and mark the lengths of items carefully with a sharp pencil. Then use the strip to transfer the marks to the wood or item to be made to scale.

Part dimensions on plans and in the instructions are given in millimeters and equivalent inches. It would be a good idea to have a small plastic or wooden scale marked in inches and millimeters so you can measure and identify the parts provided.

Parts

All parts: castings, rod, wire, tubing, sheet stock, laser-cut wood, wood strips, and rigging line are designated by a letter-number (such as W045) on plans and sketches. A parts list is included in each of the construction stages, noting the parts required for that particular stage. A master packaging parts list (separate from these instructions) is provided, listing the quantities included in the kit. For wood strips, sheets, rod, wire, tubing, and rigging, one or several pieces are provided in the kit as noted on the master packaging parts list. Each of these have been assigned a Model Expo stock part number. These parts must be cut to length or shape according to plan dimensions.

For identification, laser-cut wood part patterns are illustrated in Appendix A and on Plan D005. Sketches of the various britannia metal castings are shown in Appendix B.

The castings for the ailerons, elevator, and rudder are not just a means of easy kit development. These parts are metal because the real airplane had welded steel rods for these parts. The kit tries to duplicate the real airplane as much as possible; wood for wood, metal for metal.

Wood

Your kit contains basswood (or Limewood) and birch plywood.

It is a good idea to sort the stripwood contained in the kit by thickness. When building a certain part, select a suitable size from the proper thickness pile. After cutting what you need, return the remaining piece to that thickness pile. This saves a lot of time looking for a given thickness.

Cast-Metal Fittings

The kit is supplied with large amounts of britannia metal castings. The britannia fittings provided may require some final finishing before they are suitable for installing on the model. Clean them up by removing any mold-joint flash. To do this, use a No. 11 hobby blade to cut the flash, then file or sand with fine sandpaper. It is also suggested that you clean the fittings thoroughly with warm, soapy water.

What You'll Need to Start Construction

The following tools and supplies are recommended for the construction process. Modelers who have built before may have their own favorites.

A. Knives and saws
1. Hobby knife
2. No.11 blades
3. Razor saw or jeweler's saw

B. Files
Set of needle files

C. Clamps and Pins
1. Alligator clips (supplied)
2. Wooden clothespins (craft shops have small versions of the design)
3. Rubber bands
4. Package of straight pins

D. Boring Tools
1. Set of miniature drills
2. Pin vise

E. Miscellaneous
1. Tack hammer
2. Tweezers (a few)
3. Small fine pointed scissors
4. Miniature pliers
   a. small round
   b. flat nose
5. Wire cutters (for cutting fine wire and strip metal)

F. Sandpaper
Fine and medium grit garnet or aluminum oxide sandpaper (#100 to #220), and #400 wet-or-dry paper for fittings and final wood sanding

G. Glue
White glue, Carpenter's wood glue (yellow in color), and Cyanoacrylate glue(super glue) can be used for most of the model. Five-minute epoxy provides extra strength for gluing fittings. On plans and sketches where this glue is recommended, it is designated by (EPX). Super glue, such as Jet, can be used for quick adhesion.The best super glue for most applications is a medium viscosity gap filling type. The watery thin type is recommended to fill a narrow crack by capillary action. On plans and sketches where this glue is recommended, it is designated by (ACR). However, it could be used in many locations.

H. Building Board
A soft, but stiff board such as acoustic ceiling tile or insulation wallboard to easily take straight pins for holding parts during assembly. This soft board should be nailed or glued to a hard board so it will be flat. Of course, you can use a table, but a portable board is convenient for turning it around as necessary to make the work easier.

Painting & Staining the Model

The ALBATROS model need not be painted or finished at all. However, it is recommended that you stain the wood parts and seal the britannia castings for protection. A light tan stain will help to make the entire structure uniform in color.

Some parts such as the landing gear and machine guns could be painted. This would add a nice contrast to the otherwise unpainted model. To make it look like the plane in the Smithsonian, paint landing gear struts, wheels, wing struts, and propeller hub dark green. Guns could be gun metal (dark grey) color. You could also paint some of the turnbuckles and other fittings black or dark grey for contrast.

The metal ailerons, rudder and elevator could also be painted gun metal or dark grey so they look more like steel, as on the real aircraft.

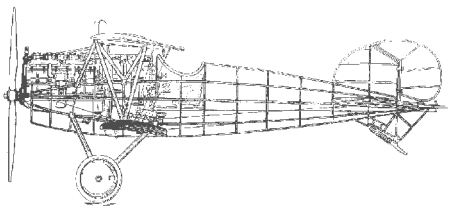
Some of the britannia parts are backed with white styrene plastic. The entire assembly can be painted silver so it looks like all britannia.

Sanding and cleaning: Sand all wood surfaces with 220-grit dry sandpaper, followed by 400-grit, and wipe off all dust thoroughly. A tack rag would be helpful.

Brushing and stains: A soft artist quality brush can be used to apply stain to the parts. Model Shipways stains or Minwax brand stains are excellent for staining. For the castings, Floquil clear flat finish is ideal.

This finish could also be applied over the stained wood parts as added protection.

Painting: If parts are to be painted, use a primer first, then paint. Model Shipways, or any of the model paints are satisfactory. For this model, flat paints will probably look better than gloss paints.

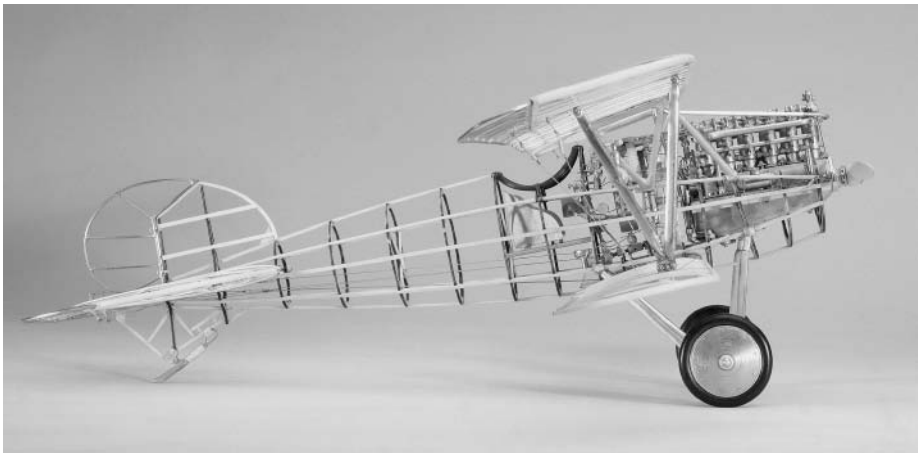


Stage 1: Building the Upper Wing

Refer to Figure 1-1 to 1-14 and plan D002 and D003.

Parts List for Stage 1

W001-		
W027	Upper wing ribs	27-laser-cut wood parts, 1 mm (3/64") thick
W028	Rib stiffeners	0.5 x 2 mm (0.021 x 5/64") wood strip
W029	Cap strips	0.5 x 2 mm (0.021 x 5/64") wood strip
W030	Leading edge	5 x 5 mm (3/16 x 3/16") wood strip
W031	Front spar	3 x 5 mm (1/8 x 3/16") wood strip
W032	Rear spar	3 x 5 mm (1/8 x 3/16") wood strip
W033	False spar	1.5 x 2.5 mm (1/16 x 3/32") wood strip
W034	Spars for aileron	3 x 4 mm (1/8 x 5/32") wood strip
W035	Wing tips (laminated)	1 x 5 mm (3/64 x 3/16") wood strip
W036	Center trailing edge(lam.)	1 x 5 mm (3/64 x 3/16") wood strip
W037	Trailing edge	0.4 mm (0.015") dia. steel rod
W038	Bands for trailing edge	Self adhesive aluminum tape
W039	Compression bars	1.5 mm (1/16") dia. Aluminum tubing
W040	Attachment brackets	8-castings
W041	Attachment struts	8-castings
W042	Turnbuckles	12-castings
W043	Alignment wires	0.25 mm (0.010”) dia gray nylon cord
W044	Strengthening pieces	1.5 x 2.5 mm (1/16 x 3/32") wood strip
W045	Strengthening pieces	0.5 x 2 mm (0.021 x 5/64") wood strip
W046	Strengthening pieces	1 mm (3/64") thick wood sheet
W047	Right aileron	1-casting
W048	Left aileron	1-casting
W049	Bands for aileron hinges	Self adhesive aluminum tape
W050	Retainers at aileron hinge	1.5 x 2.5 mm (1/16 x 3/32") wood strip



Stage 1: Building the Upper Wing

Wing ribs (W001-027): Each wing rib has seven vertical stiffeners (W028) on both sides of the ribs. The first step in preparing the ribs is to glue the stiffeners in place. The stiffeners will at first be a long strip, gluing all ribs to the strips, and then the strips will be cut off flush with the top and bottom of each rib.

On plan D002, top left, the ribs are shown with the location of the strips. The drawing shows the layout. First, lay some wax paper or plastic wrap over the plan so you will not get any glue on the plan itself. Next, lay some strips of double sided tape on the plan. This tape is to hold the stiffener strips in place. You can also simply pin the strips down on the plan. Place all the strips on the plan. Notice that the strips on each side of the square spar holes are 3 mm (1/8") apart. Maintain this spacing (Figure 1-1).

Place each laser-cut rib over the plan to make sure you know which rib is which. With the strips in place, glue all the ribs to the strips, and hold down with a small weight. You now have stiffeners on one side of the ribs (Figure 1-2). When the glue has dried, glue strips on top of the ribs directly above the bottom strips. You now have stiffeners on the other side (Figure 1-3).

When the glue has dried, remove the ribs from the board. Next, cut off the strips from each rib flush with the top and bottom of each rib. You now have ribs with stiffeners on both sides.

Cap strips (W029): Lay each rib down on the building board and place pins through the lightening holes to hold the ribs in place. Next, glue on the cap strips (Figure 1-4). The upper and lower cap strips extend beyond the laser-cut ribs. Measure the required length of cap strips from the plans. Hold the cap strips against the ribs with pins while the glue dries. Note that the edges of the cap strips are flush with the vertical stiffeners.

Enlarging spar holes : The two square holes in the ribs where the spars will pass, were laser-cut smaller than required, so as to have the rib in one piece. Now that the cap strips are in place, enlarge the holes so that they go up and down to the cap strips (Figure 1-5). A small square needle file is ideal for enlarging the holes.

The basic ribs with vertical stiffeners and cap strips are now complete. Sand each rib with 220 grit, then 400 grit sandpaper so they are smooth and free from fuzz.

Inserting the spars: Lay out plan D003 on your work board and cover the upper wing drawing with plastic wrap or wax paper. The upper wing will be assembled flat on the plan. There is no dihedral on this wing.

The two wing spars, W031 and W032, must be beveled on top in order for them to fit the holes in the wing ribs. Also, the spars are tapered at the ends. The taper should be equal top and bottom, so that the wing tips, when installed, will be true from leading to trailing edge.

Slide the ribs on the spars, then position the assembly over the plan. Locate all the ribs, then pin the assembly down. Glue the spars to the ribs. Super glue would be good here, as capillary action will take glue into the joint.

Next, glue the false spars (W033) between the ribs, then add the aileron spars (W034). Before installing the aileron spars, cut a half-round groove in the back side so the aileron will fit in the groove. Next, add the leading edge (W030) (Figure 1-6). The sketch shows a scrap piece pinned to the board to hold the leading edge in place. The leading edge must be shaped round per the plan. However, this can be done later, after the wing is removed from the board, or you can pre-shape it beforehand.

Wing tips (W035) and center trailing edge (W036): Figure 1-7 and Figure 1-8 shows the tip and center trailing edge being laminated around a form. The laminations are 3 pieces of 1 mm thick wood strips. Instead of a form, you can place waxed paper over the plan and use straight pins to act as a form. Soak the wood strips and bend around the form. Let dry, then add super glue to the laminations. Shape as required.

Fit the tips and center trailing edge on the wing (Figure 1-9 and Figure 1-10). Next, add the rod trailing edge (W037). Glue to the back of the ribs (Figure 1-10). Cut a piece of the band sheet (W038) and glue over each connection at the ribs (Figure 1-11).

At this time, the wing can be removed from the board, but make sure the glue has thoroughly dried. Wait at least 24 hours to make sure. Otherwise, some warpage may occur. Again, sand the entire assembly.

Compression bar (W039), and brackets (W040, W041): Cut the compression bars to length, then slide on the attachment bracket and strut (Figure 1-12). Careful here; W041 has the attachment for the wing struts .

These are located just outboard of the center trailing edge, and also out at the end. See section D-D on plan D003. W040 goes at the other positions.

Glue the fittings in position. Lay the wing back over the plan for positioning (Figure 1-13). Notice in the sketch that epoxy is recommended for gluing the fittings.

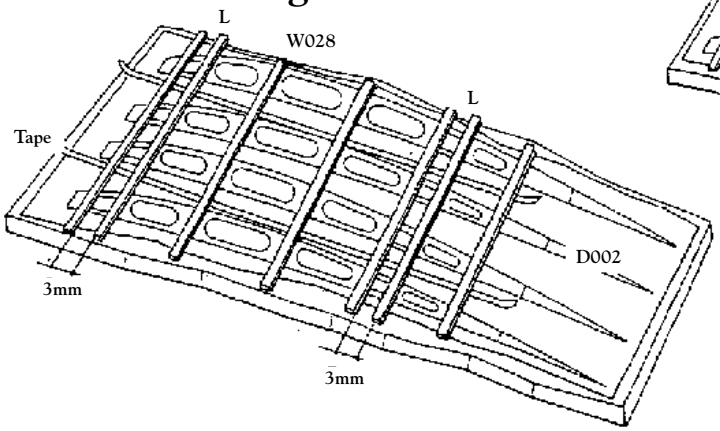
Alignment wire (W041): The layout of the wires (nylon cord in the kit) is shown on plan D003. Turnbuckles (W042) are used at the fitting on the front spar. There is a very short line from the fitting to the turnbuckle, then the line continues on the other side of the turnbuckle. Feed the line to the rear spar fitting, and hold it with a weight (Figure 1-13) to keep it tight. Then seize a thread around the line and cut off the excess.

Ailerons (W047,W048): Fix the ailerons using the band sheet (W049) cut into small strips. Epoxy in position. Add the retainer strips (W050) on the inside of the spar (Figure 1-14).

Strengthening pieces (W044, W045, W046): Refer to plan D003. Fit pieces of W044 between ribs and spars as shown on the plan. These appear at wing tips, around the center trailing edge, and at the inside corners of ailerons. Double up, if necessary, to fill the space shown. All these pieces should be to the underside of cap strips. W045, and W046 go over spars and are flush with the top of cap strips. After gluing in place, sand flush with cap strips. Cut the triangular parts from the sheet provided.

With the upper wing completed and sanded, stain and paint parts as desired. Refer back to the painting section in these instructions for some suggestions. Wrap the finished wing in plastic wrap and store it in a safe place, out of reach of animals and children.

Fig. 1-1



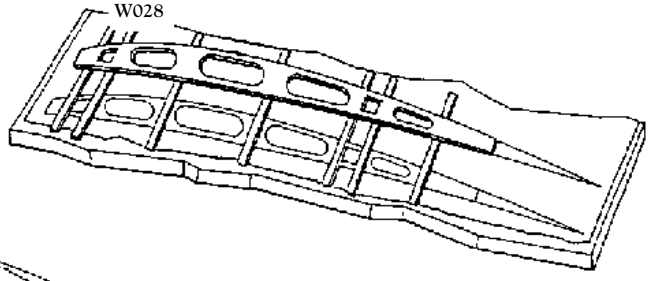


Fig. 1-2

Fig. 1-3

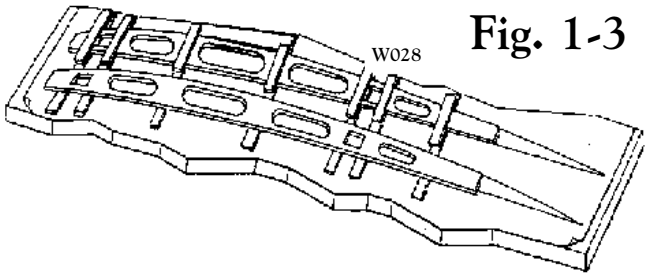


Fig. 1-4

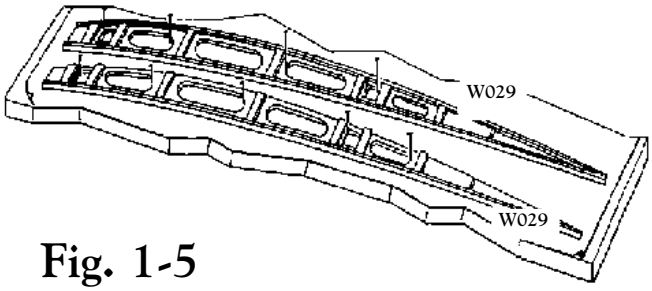
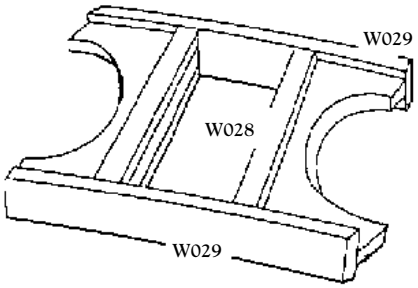


Fig. 1-5



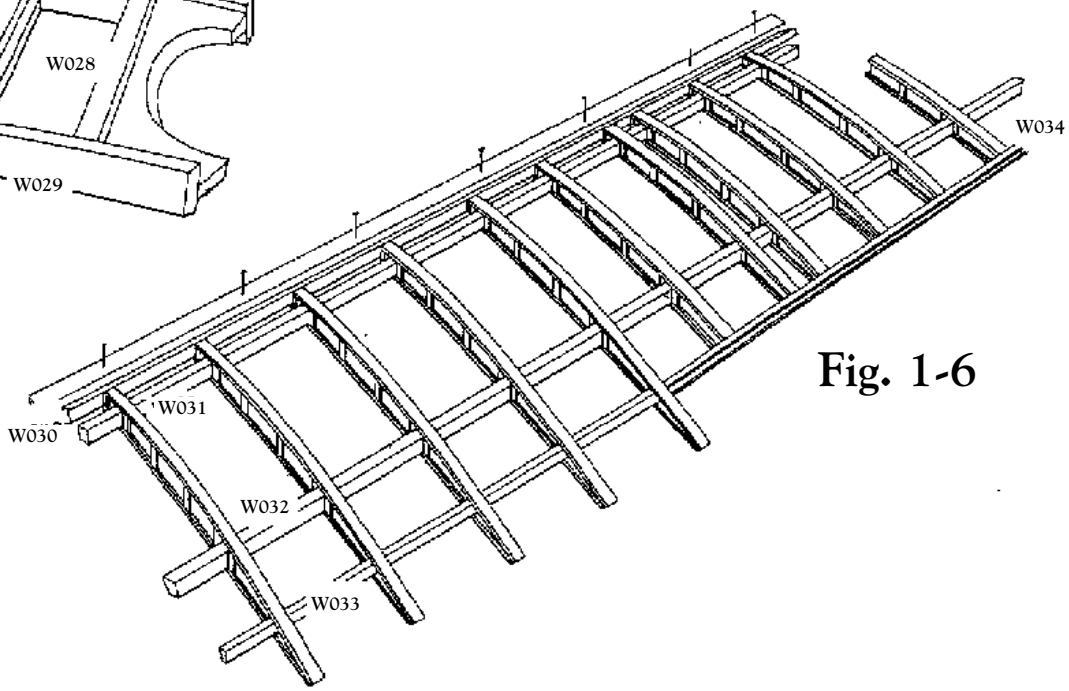
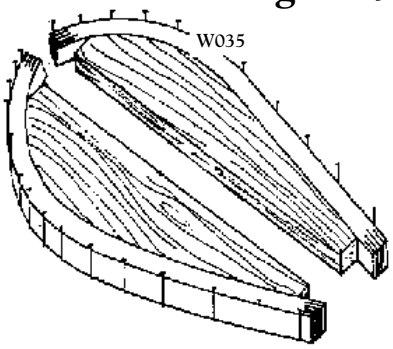


Fig. 1-6

Fig. 1-7



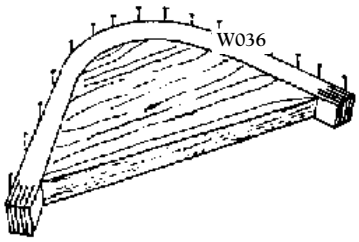


Fig. 1-8

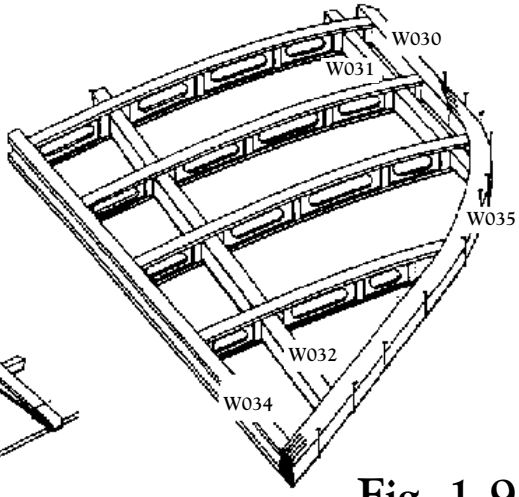


Fig. 1-9

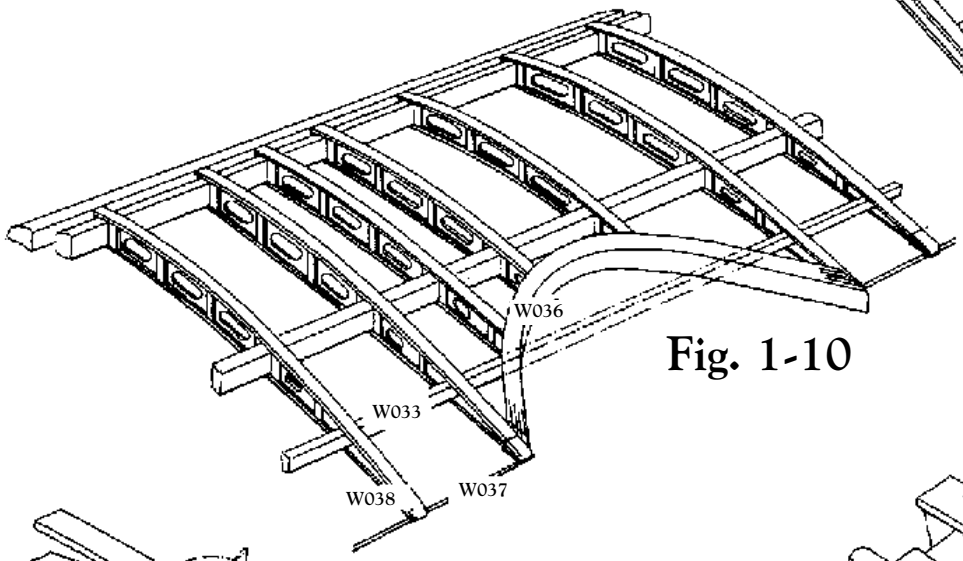


Fig. 1-10

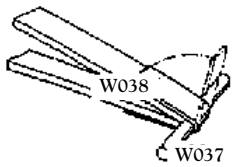


Fig. 1-11

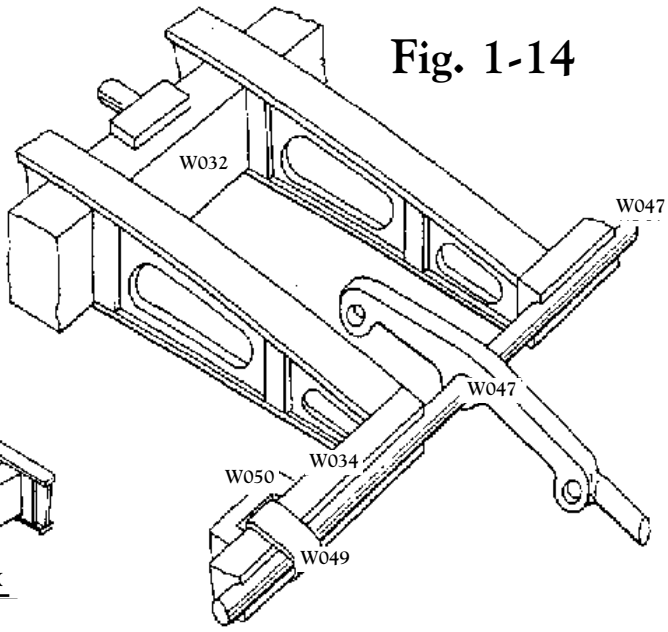


Fig. 1-14

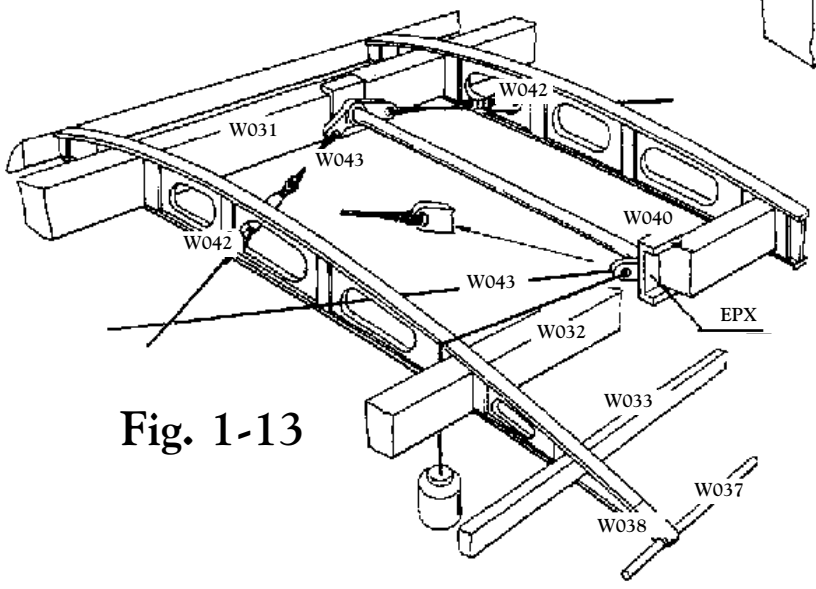


Fig. 1-13

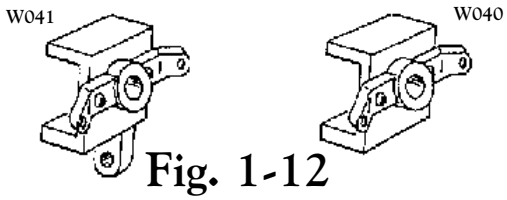


Fig. 1-12

Stage 2: Building the Lower Wing

Refer to Figures 2-1 to 2-5 and plans D002 and D003.

Parts List for Stage 2

W051-76	Lower wing ribs	28-laser-cut wood parts, 1 mm (3/64") thick
W077	Rib stiffeners	0.5 x 2 mm (0.021 x 5/64") wood strip
W078	Cap strips	0.5 x 2 mm (0.021 x 5/64") wood strip
W079	Leading edges	2.5 x 4 mm (3/32 x 5/32") wood strip
W080	Front spars	2 x 3 mm (5/64 x 1/8") wood strip
W081	Main spars	4 x 5 mm (5/32" x 3/16") wood strip
W082	Rear spars	2 x 3 mm (5/64 x 1/8") wood strip
W083	Wing tips(laminated)	1 x 5 mm (3/64 x 3/16") wood strip
W084	Trailing edges	0.4 mm (0.015") dia. steel rod
W085	Bands for trailing edge	Self adhesive aluminum tape
W086	Compression bars	6-castings
W087	Guide tubes	2.5 mm (3/32") dia. aluminum tubing
W088	Attachment struts	2-castings
W089	Pulley supports	2-castings
W090	Strengthening pieces	2 x 3 mm (5/64 x 1/8") wood strip
W091	Strengthening pieces	0.5 mm (0.021") thick wood sheet
W092	Guides	4-castings (half castings)
W093	Tube wire guides	3 mm (1/8") dia. aluminum tubing
W094	Strengthening pieces	0.5 x 2 mm (0.021 x 5/64") wood strip
W095	Double pulleys	2-castings

Wing ribs (W051-76): The lower wing is built in two halves. These will join at the fuselage, and they do have a little dihedral. Prepare the ribs with stiffeners and cap strips exactly the same way as you did for the upper wing in Stage 1. Only a few differences: on the layout on plan D002, some ribs do not have stiffeners on both sides, and some have no stiffeners at all in certain locations. The layout on D002 clearly shows where the strips go. Also, notice that the lower wing ribs only extend back to the rear spar (W082).

Cap strips (W078): The cap strips are added like the upper wing. Bevel the upper cap at trailing edge and glue to the lower cap.

Spars: Bevel the top edge of the front spars (W080) and the rear spars (W082) and taper the ends to fit the rib holes (front) and pass under the cap strip (rear). The main spars (W081) should not require a bevel, but do need to be tapered at the outer edge. The leading edge (W079) is applied like the upper wing. The trailing edge rod (W084) and bands (W085) are also applied like the upper wing.

Before sliding the ribs on the spars, some cuts must be made in some of the spars to receive fittings as follows:

Main spar cuts: At the inboard end of the main spars, cut a tenon 3 x 3.5 mm (1/8 x 5/32"). Lift the exact location from the plans. This tenon will fit in the guide (W092). Figure 2-2 and 2-3 illustrate this. Next, cut the slots on top of the spar for the three (each side) compression bar fittings (W086). Figure 2-2 and 2-3 also shows these cuts and the fitting. Out near the end of the spars, cut the slot top and bottom of the spar for the attachment strut (W088). See Figure 2-4.

Front spar cuts: Like the main spar, cut the slots for the front end of the compression bar fittings (Figure 2-2 and Figure 2-3).

Front spar cuts: Like the main spar, cut the slots for the front end of the compression bar fittings (Figure 2-2 and Figure 2-3).

Insert the guide fitting (W092) in the inboard ribs W051 and W064 (Figure 2-2 and Figure 2-3). Before adding any other fittings, slide the spars in place. Insert the tenon of the main spar into the guides. Lay the wing over plan D003, align the ribs, then glue in place.

Wing tips (W083): As with the upper wings, the tips are laminated.

Tube wire guide (W093): Cut tubing to correct length. Flatten the round tube provided into an oval and Insert through the two inboard ribs (Figure 2-3).

Compression bars (W086) and guide tube (W087): Glue W086 in place in the slots on the front and main spars, then slide in and glue the tube guides (Figure 2-3).

Attachment strut (W088), pulley support (W089), and double pulley (W095): Fit the attachment struts over the slots cut in the main spars. Add the double pulley to the pulley support, then glue to the spar and attachment strut (Figure 2-4 and Figure 2-5).

Strengthening pieces (W090, W091): Fit these just as you did for the upper wing. Sand W091 pieces flush with the top of cap strips. As with the upper wing, sand, stain, and paint to your satisfaction, wrap, and put away for safe keeping.

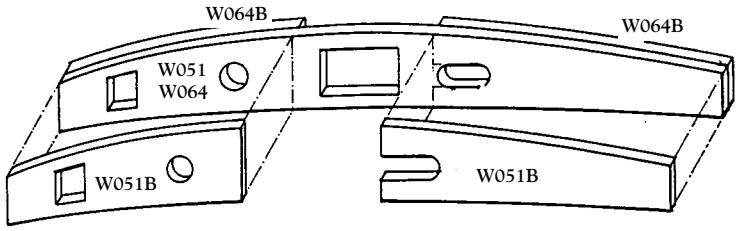


Fig. 2-1

Fig. 2-2

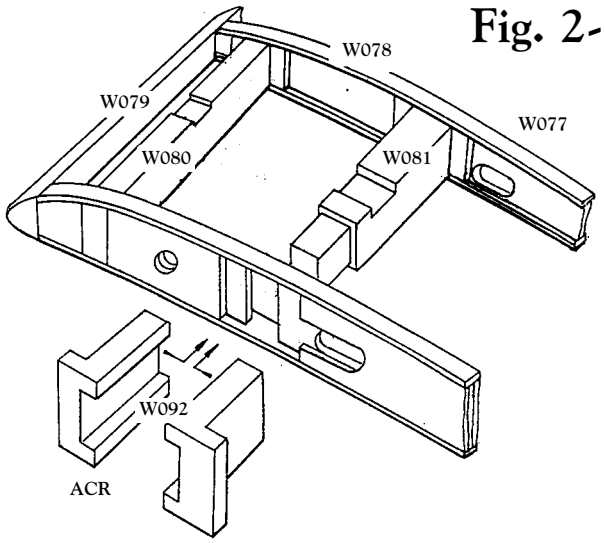


Fig. 2-3

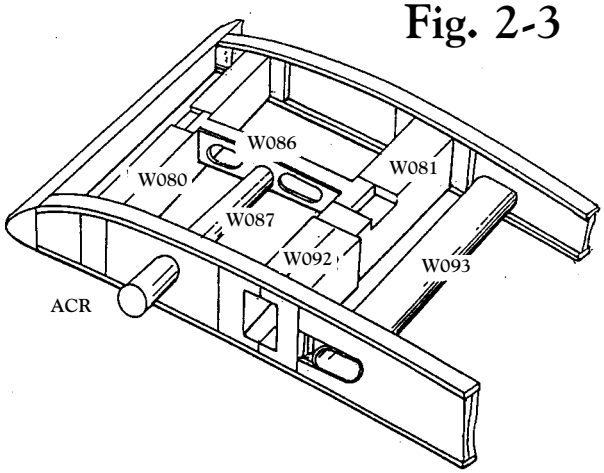


Fig. 2-4

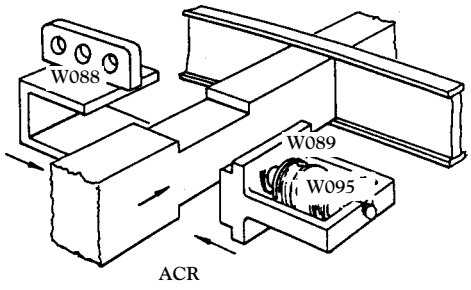
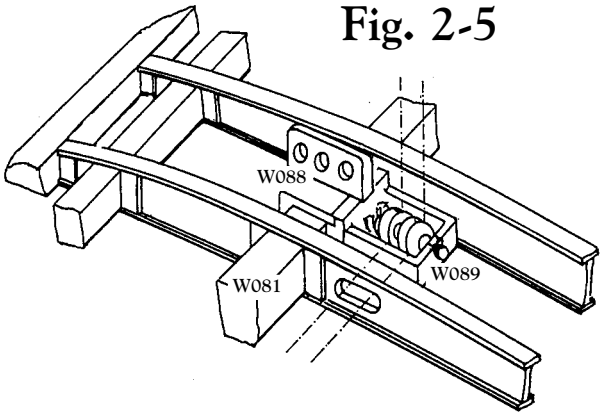


Fig. 2-5



Stage 3: Building the Stabilizer

Refer to Figures 3-1 to 3-3 and plan D002.

Parts List for Stage 3

F044	Long stabilizer ribs	2-laser-cut wood parts, 1 mm (3/64") thick
F045	Medium stabilizer ribs	2-laser-cut wood parts, 1 mm (3/64") thick
F046	Short stabilizer ribs	2-laser-cut wood parts, 1 mm (3/64") thick
F047	Front longeron ribs	2-laser-cut wood parts, 1 mm (3/64") thick
F048	Rear longeron ribs	2-laser-cut wood parts, 1 mm (3/64") thick
F049	Leading edges(laminated)	1 x 4 mm (3/64 x 5/32") wood strip
F050	Corner strips	1.5 x 3 mm (1/16 x 1/8") wood strip
F051	Rear elevator longeron	3 x 3.5 mm (1/8 x 5/32") wood strip
F052	Guide	1.5 x 3 mm (1/16 x 1/8") wood strip
F053	Strengthening pieces	1 mm (3/64") thick wood sheet
F054	Elevator	1-casting
F057	Cap strips	0.5 x 2 mm (0.021 x 5/64") wood strip

General: The stabilizer is built first as a single unit with the elevator temporarily attached. The elevator is then removed and the stabilizer separated into two sections. Each section fits the root ribs on the fuselage. The installation of the stabilizer sections, and permanent attachment of the elevator, is covered in a later stage.

Ribs and longerons: Cut the rear longeron (F051) to length, then cut the groove on the rear side to receive the round front section of the elevator. Then temporarily tape the elevator to the longeron. Lay the assembly over the drawing on plan D002. Don't forget your plastic wrap. Place some scrap pieces under the longeron.

The ribs are tapered so you need to raise the leading edge and the trailing edge off the plan. See Figure 3-1.This figure also shows ribs F044 and the front longeron ribs, F047. Pin all these parts in place over the drawing. Make certain that ribs F044 are perfectly vertical. These ribs will meet the root ribs on the fuselage.
Fit the other ribs and longerons. Notice that they go together egg-crate fashion.Glue all joints. Also, fit the guide pieces at the rear longeron (Figure 3-2).

Leading edges (F049) and corner strips (F050): Like the wing tips, the leading edge is a laminated piece. Pin in place and glue to the longerons. Add the corner pieces at the same time (Figure 3-2).

Cap strips (F057): Add the cap strips on top of the ribs and longerons. After you remove the unit from the building board, you can add the cap strips on the bottom (Figure 3-3). Also, round the leading edge at this time.

Strengthening pieces (F053): Cut the wedge shaped pieces from the sheet provided. Notice that these pieces are flush with the top of the ribs and longerons (under the cap strips). See Figure 3-3.

Finally, remove the elevator, then cut the rear longeron (F051) directly on centerline so you now have two separate sections of stabilizer. Sand both units and stain.

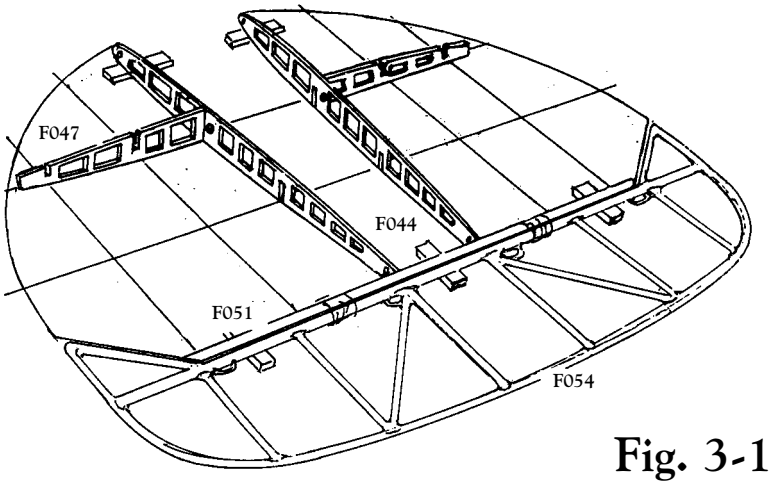
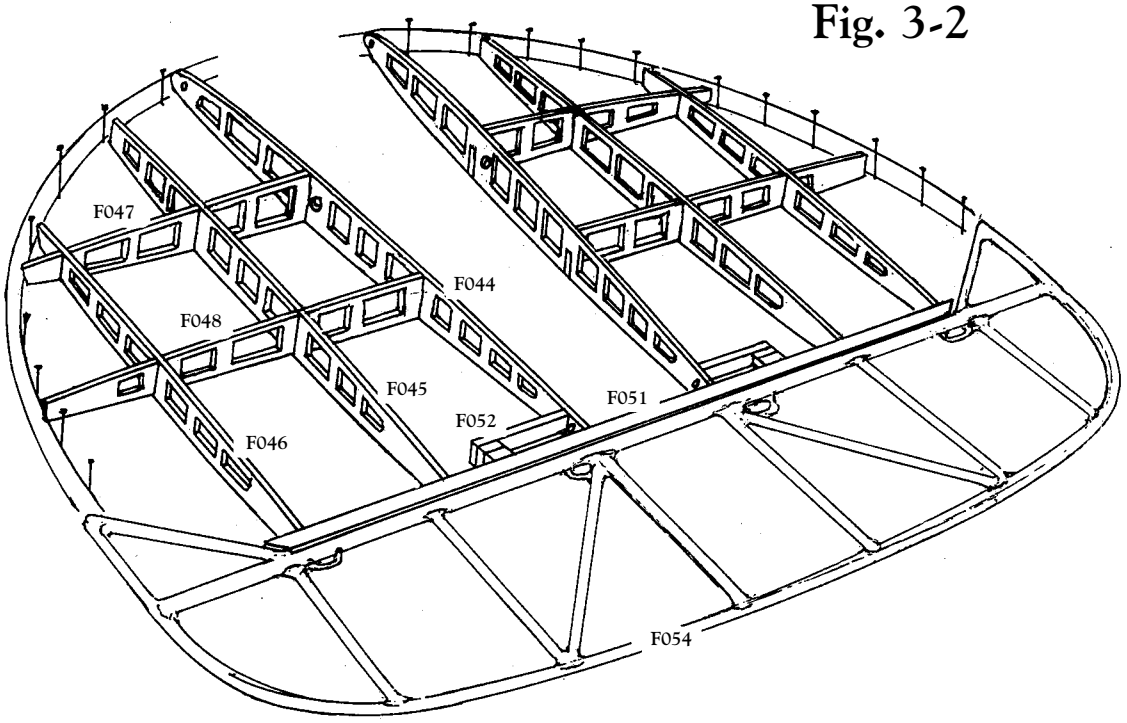


Fig. 3-1

Fig. 3-2


F047
F044
F048
F045
F051
F052
F046
F054

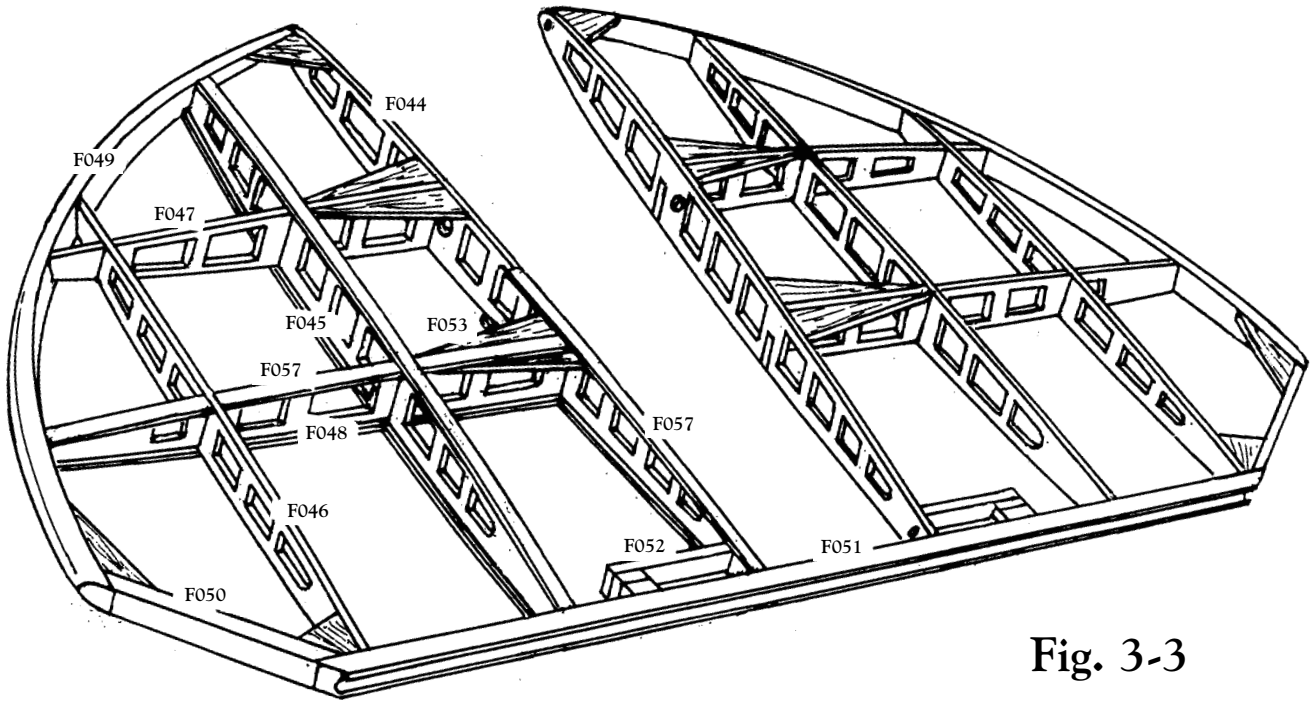

F044
F049
F047
F045
F053
F057
F057
F048
F046
F052
F051
F050

Fig. 3-3

Stage 4: Building the Basic Fuselage

Refer to Figures 4-1 to 4-12 and plan D002.

Parts List for Stage 4

F001-014	Fuselage bulkheads	14-laser-cut wood parts, 1.5 mm (1/16") thick
F015	False bulkhead	1-laser-cut wood part, 1.5 mm (1/16") thick
F016	False bulkhead	1-laser-cut wood part, 1.5 mm (1/16") thick
F017	Frame on F005	1-laser-cut wood part, 1.5 mm (1/16") thick
F018	Strips on F005	1 x 1 mm (3/64 x 3/64") wood strip
F019	Bayonet connection	2-castings
F020	Strips on F008/F010	1 x 1 mm (3/64 x 3/64") wood strip
F021	Stiffening	1 mm (3/64") thick wood sheet
F022	Main side longerons	2 x 2 mm (5/64 x 5/64") wood strip
F023	Upper longeron	1.5 x 1.5 mm (1/16 x 1/16") wood strip
F024	Upper side longerons	1.5 x 1.5 mm (1/16 x 1/16") wood strip
F025	Stiffening	1.5 mm (1/16") thick wood sheet
F026	Lower side longerons	1.5 x 1.5 mm (1/16 x 1/16") wood strip
F027	Lower longeron	1.5 x 3 mm (1/16 x 1/8") wood strip
F028	Rib center section	2-laser-cut wood parts, 1.5 mm (1/16") thick
F029	Engine bearer	3 x 4 mm (1/8 x 5/32") wood strip
F030	Engine ledges	2-laser-cut wood parts, 1.5 mm (1/16") thick
F031	Fin stiffening	1 mm (3/64") thick wood sheet
F032	Cockpit floor	1-laser-cut wood part, 1.5 mm (1/16") thick
F033	Seat rails	1.5 mm (1/16") dia. Brass rod
F034	Fin leading edge (lam.)	1 x 4 mm (3/64" x 5/32") wood strip
F035	Fin top strip	1.5 x 3 mm (1/16 x 1/8") wood strip
F036	Fin rib strips	0.5 x 2 mm (0.021 x 5/64") wood strip
F037	Stabilizer attachment ribs	2-laser-cut wood parts, 1.5 mm (1/16") thick
F038/40	Stabilizer attachment rods	1.5 mm (1/16") dia. brass rod
F039	Stabilizer attachment rod	2 mm (5/64") dia. brass rod
F041	Lower fin strips	1.5 x 1.5 mm (1/16 x 1/16") wood strip
F050	Support strip for fuel tank	1.5 x 3 mm (1/16 x 1/8") wood strip
F060	Magneto switch panel	1.5 mm (1/16") thick wood sheet
F062	Tail skid attachment	1-casting
F063	Tail skid	1-casting
F064	Tail skid rope	White Nylon cord, 1.5 mm (1/16") dia.
F065	Pivot for tail skid	3-castings (A016 and A017)
F066	Shock cord for tail skid	White Nylon cord, 1.5 mm (1/16") dia.
	Fuselage building jig	15-laser-cut wood parts, 4 mm (5/32") thick
	Jig base strips	7 x 14 mm (1/4 x 1/2" x 24") wood strips
	Fuselage support stands	5-laser-cut wood parts, 4 mm (5/32") thick

General: The fuselage will be assembled upside down on a building jig, then turned upright and supported by two laser-cut stands for completion.

Building the jig: Assemble the building jig as show in Figure 4-1 and plan D002. Glue all bulkhead holders to the center unit. Glue the long base strips on each side of the center unit at the bottom. The entire assembly can be glued to a larger baseboard if desired.

Bulkhead preparation: Before you begin using the building jig, complete all the attachments to bulkhead F005, F008, and F010. First, glue the bayonet connection castings (F019) to bulkhead F005 (Figure 4-2). Glue the frame (F017) and strips (F018) at the top of the bulkhead, and the fuel tank support strip (F050). Next, glue the strips (F020) and the stiffening (F021) to bulkheads F008 and F010. See plan D002.

Installing the bulkheads and lower longerons: Using the clamps provided, temporarily clamp the bulkheads to the building jig frames. The top of the jig frames locates the bottom of the main longerons (F022). Adjust the bulkheads so the longeron fits the bulkhead slots at top of the jig. See Figure 4-3 and plan D002. Next, install the other lower longerons: F026 (both sides) and F027 (bottom). The longerons F022 and F027 meet aft of bulkhead F014 as shown in Figure 4-4. Note that the lower longeron (F027) tapers aft of bulkhead F012, so it is the same size as F022 at the end. Longerons F026 stop at bulkhead F014.

The longerons should be installed without glue until the aft end is mated properly. Let them extend beyond the fuselage at first. Hold the longerons in place with rubber bands as shown in Figure 4-3. When the end joint is correct, you can then remove the longerons one at a time, add glue, and reinstall in the bulkhead slots. Measure the exact length from the plans. Finally, cut the longerons off at bulkhead F001.

False bulkheads (F015 and 16): Add the false bulkheads as shown in Figure 4-5.

Lower fin and skid: Cut strips and install the lower fin pieces (Figure 4-6). Next, add the tail skid attachment (F062), the tail skid (F063) and the pivot pin (F065). Wrap the tail skid with the rope (F064) and secure with the shock cord (F066) as shown in Figure 4-7. The shock cord for the model is a nylon cord and not actually a rubber stretch cord per the original aircraft.

Support stands: You can now remove the fuselage from the building jig, invert it and strap it to the two laser-cut stands. Assemble the stands and secure with rubber bands as shown in Figure 4-8.

Top longerons: Add the top longerons (F023 and F024) like the lower ones, first holding in place with rubber bands, then gluing in place (Figure 4-8).

Engine bearers and ledges: Install the engine bearers (F029) and the laser-cut ledges (F030) as shown in Figure 4-9.

Rib center sections and stiffening: Fit the laser-cut rib center sections (F028) over the Bayonet connection castings (F019) as shown in Figure 4-10. Cut and add the triangular stiffening pieces (F025). Note that F028 is parallel with the centerline of the fuselage. The lower wings will eventually mate with this rib. It has a hole for receiving the tubing in the lower wings.

Cockpit floor (F032), magneto switch panel (F060), and seat rails (F033): Glue the cockpit floor, and magneto switch panel in place, and add the brass seat rails in the bulkhead holes as shown in Figure 4-11.

Upper fin: Laminate the fin leading edge (F036) and glue in place, then add F035 and the rib strips (F036). See Figure 4-12.

Stabilizer attachment ribs: See Figure 4-12. First glue in the F050 strip on top of the side longerons. This strip provides a support for the front of the attachment ribs. Slide the three rods (F038,39, and 40) through the ribs when in position. The front rod rests on the F050 strip. The rear rod centers on the end of the longerons. The ribs are parallel to the fuselage centerline. When the ribs are aligned, glue the rods in place. Later, the stabilizer halves will be glued to the rods and attachment ribs. The rods fit the holes in the stabilizer ribs.

At this time, sand the entire fuselage assembly.

Fig. 4-1

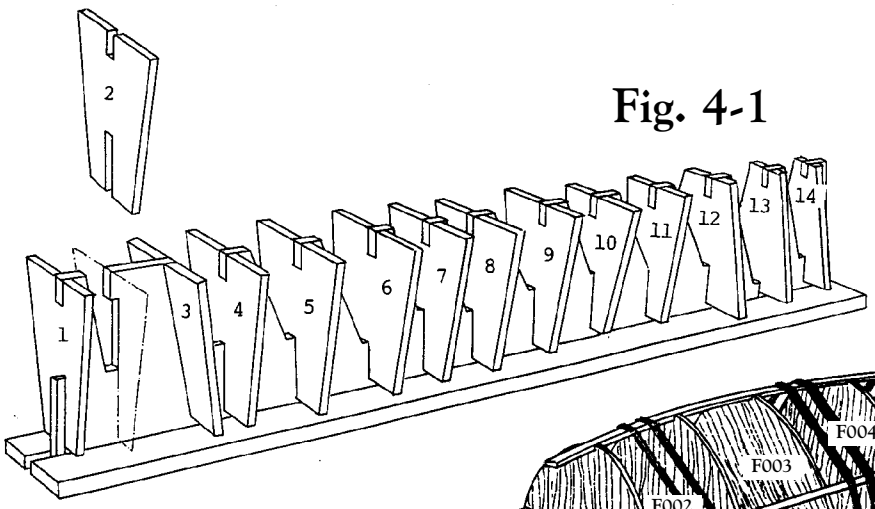


Fig. 4-2

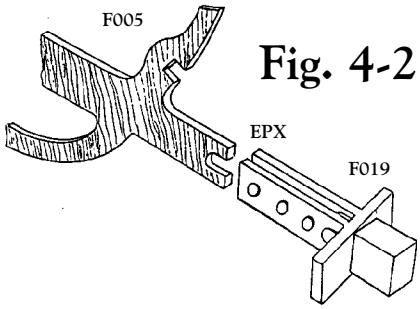


Fig. 4-3

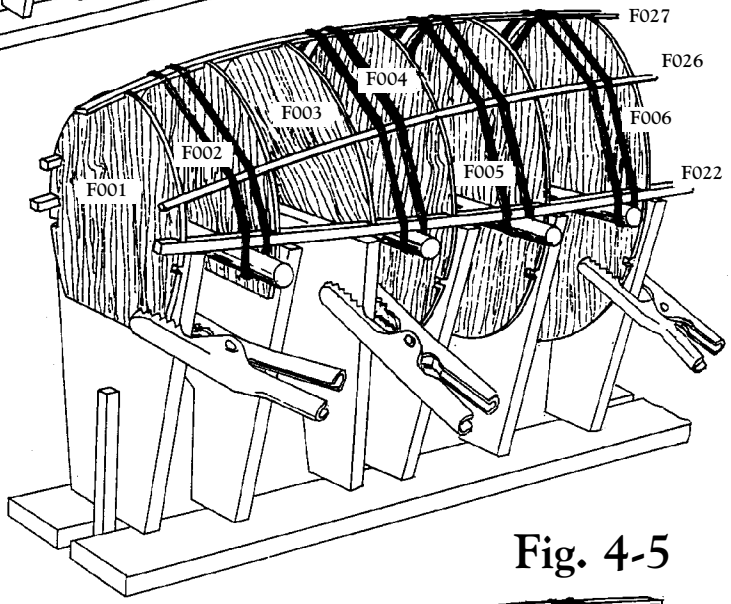


Fig. 4-4

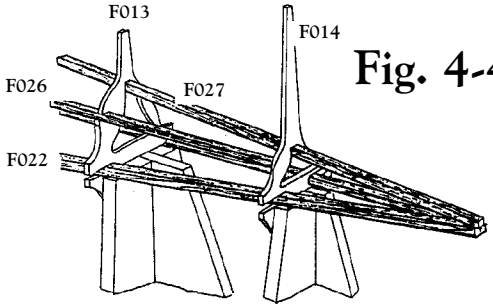


Fig. 4-5

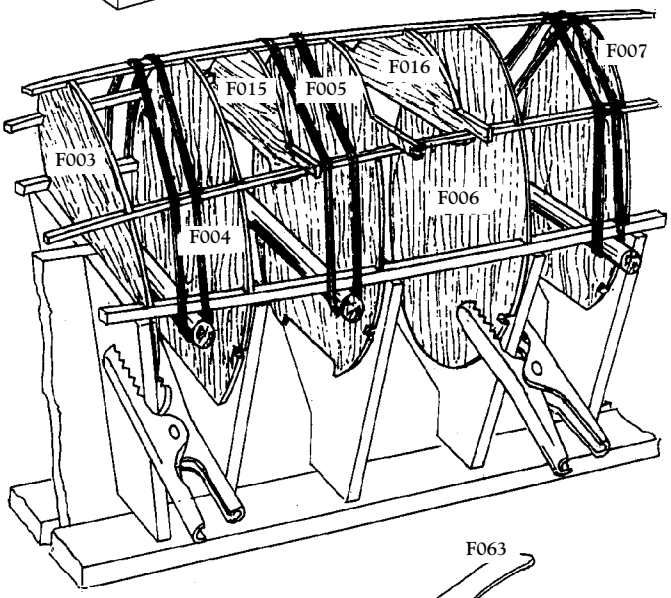


Fig. 4-6

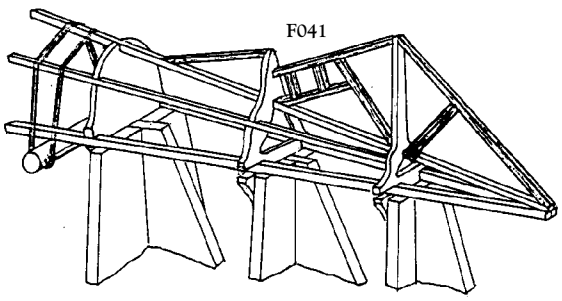


Fig. 4-7

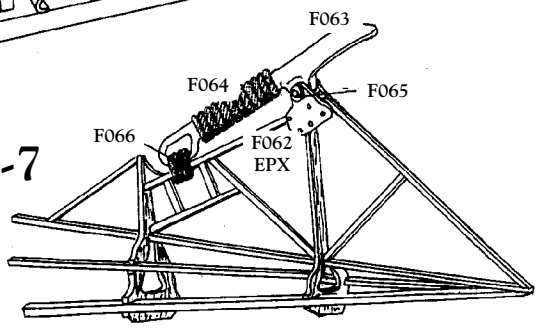


Fig. 4-8

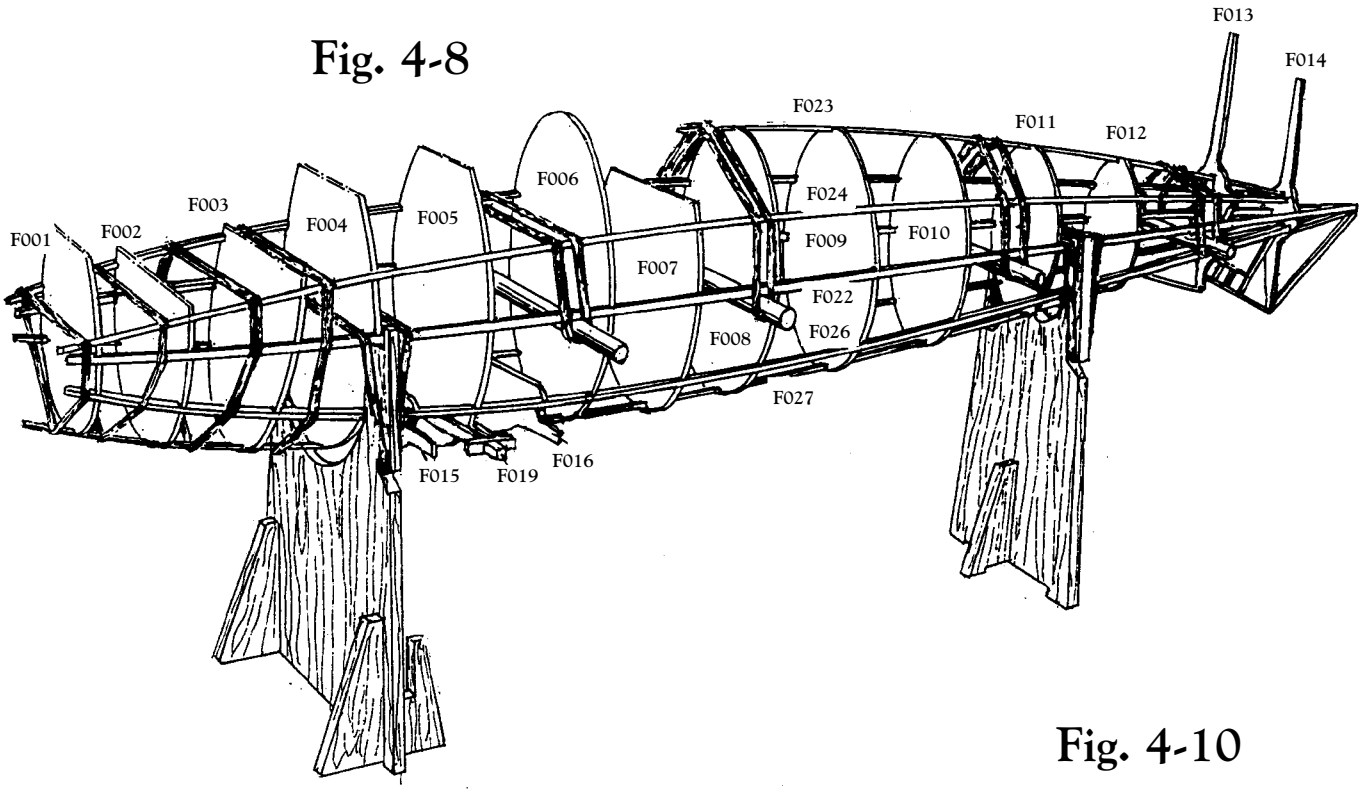


Fig. 4-10

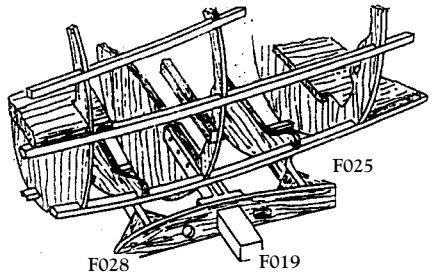


Fig. 4-9

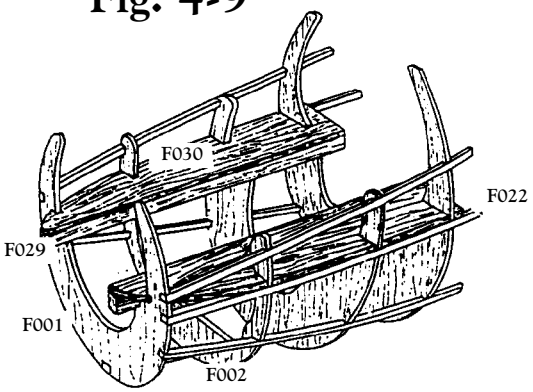


Fig. 4-11

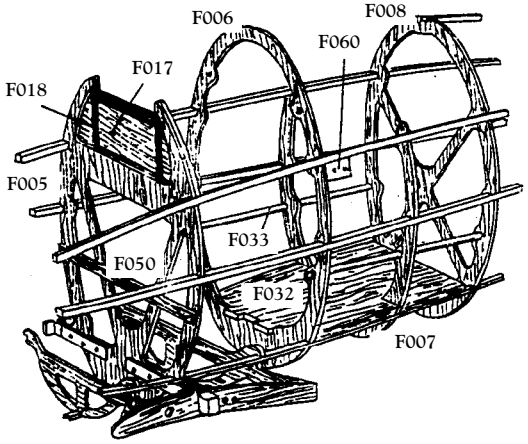
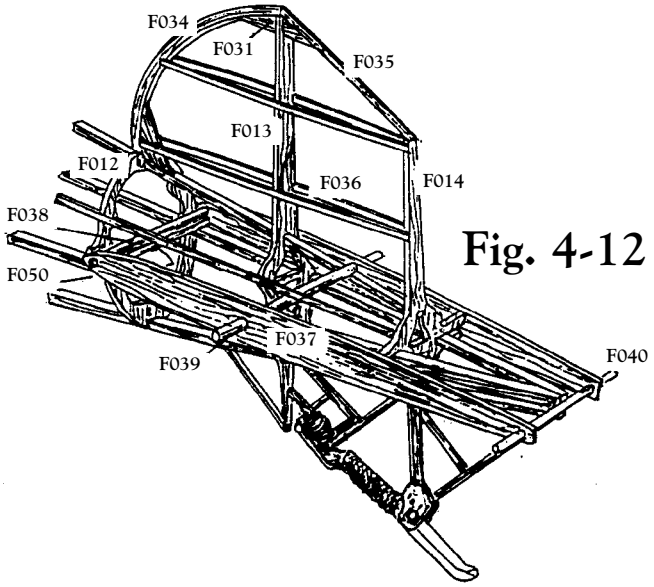


Fig. 4-12



Stage 5: Installing Internal Fuselage Fittings

Refer to Figure 5-1 to 5-8 and plan D004.

Parts List For Stage 5

C001	Oil tank body	8 mm (5/16") dia. aluminum tubing
C002	Oil tank end caps	2-castings
C003	Fuel tank body	1-casting
C004	Fuel tank end walls	0.4 mm (0.016") thick styrene
C005	Fuel tank joint	1-casting
C006	Oil and fuel tank taps	2-castings
C007	Fuel tank pressure tap	1-casting
C008	Fuel tank drain tap	1-casting
C009	Live ammo box body	1-casting
C010	Live ammo box walls	0.4 mm (0.016") thick styrene
C011	Used cartridge box body	1-casting
C012	Used cartridge box walls	0.4 mm (0.016") thick styrene
C014	Ammo box support strips	1.5 x 1.5 mm (1/16 x 1/16") wood strip
C019	Rear gun support	1-casting
C020	Nuts	4-castings (A016)
C021	Front gun support	1-casting
C022	Tachometer	1-casting
C023	Pressure gauge	1-casting
C024	Fuel valves	4-castings
C025	Fuel indicators	4-castings
C026	Fuel valve handles	4-castings
C027	Fuel filter	1-casting
C028	Rod	2-castings (A017)
C029	Lower bar control support	2-castings
F042	Valve support panel	1-laser cut wood part, 1.5 mm (1/16") thick
F043	Panel bottom bracket	1-laser-cut wood part, 1.5 mm (1/16") thick
C042	Rudder bar support	1-casting
C043	Air pressure line	1.5 mm (1/16") diameter brass rod (10 mm)
C044	Rudder bar	1-casting
C045	Pivot for rudder bar	2 mm (5/64") dia. aluminum rivet, 2 mm x 11 mm
C046	Rudder bar crank	1-casting
C047	Foot arrest	0.8 mm (1/32") dia. brass wire
C050	Pulley support	2-castings

General: This stage deals mainly with the installation of castings. Clean them good and use epoxy glue for installation.

Oil tank: Assemble the oil tank using the cylinder (C001), end caps (C002), and the oil tap (C006). Glue the tank to the engine ledge as shown on plan D004.

Fuel tank: See Figure 5-1 and 5-2. To the ends of the fuel tank body (C003), glue on the end walls (C004). The walls are cut from styrene sheet provided in the kit and should be painted aluminum color. Then add the fuel tap (C006), pressure tap (C007), the drain tap (C008) at the bottom, and finally the joint fitting (C005) on the front of the tank. Glue the completed tank against bulkhead F005 onto the support strip F050.

Front gun support: Glue the gun support (C021) to bulkhead F005 as shown in Figure 5-2.

Live ammo and used cartridge boxes: Like the fuel tank, these boxes are composed of a casting body and styrene end walls. Cut the walls (C010 and 12) to shape and glue on the ends of the casting bodies (C009 and C011). Install the live ammo cartridge boxes and add the support strips (C014). Next, glue the used cartridge box on the support strips (Figure 5-4).

Rudder bar assembly: The rudder bar assembly is made up of parts C042, C044, C045, C046, and C047 as shown in Figure 5-5. Mount the assembly onto the false bulkhead F016 as shown in Figure 5-6.

If you want the assembly free to rotate, so do not glue C045 to C042. Rudder wires will be attached to C046 later.

Note: It would be wise to attach the rudder cables at this stage before installing the unit. Refer to the notes at the end of stage 6.

Lower control bar supports (C029): Add the two support castings as shown in Figure 5-6. These supports will hold the cockpit control rod to be installed in a later stage.

Pulley and pulley supports (C050): Install on both sides as shown in Figure 5-6. These pulleys will take aileron wires to be installed later.

Fuel control valves and support panel: See Figure 5-7 and 5-8. First, glue the wood support panel(F042) and the wood bracket (F043) together. Next assemble the pressure gauge (C023), valves (C024), indicators (C025), handles (C026), and fuel filter (C027) to the wooden support panel. When assembled, glue the support panel to the fuselage as shown in Figure 5-8.

Rear gun supports (C019), tachometer (C022), Bearings (C020) and support rods (C028): Glue the tach to the rear gun support casting (Figure 5-8). Insert the bushings (nuts) (C020) into the holes in bulkhead C006 and slide in the rods (C028). Place the rear gun support casting in place and slide the other end of the rods into the castings (Figure 5-8). Glue all joints.

Stage 6 will add some more details to the fuselage. Stop a moment, and see that all the fittings up to this point are secure in place, and clean up where necessary.

Fig. 5-1

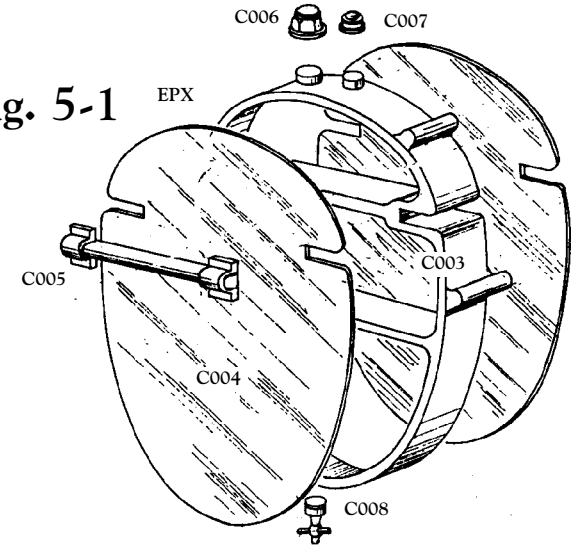


Fig. 5-2

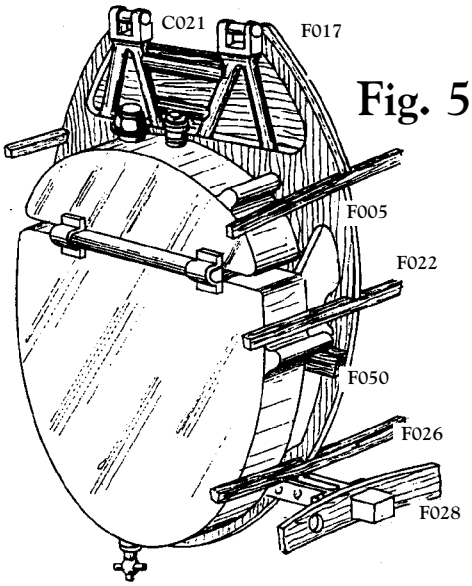


Fig. 5-3

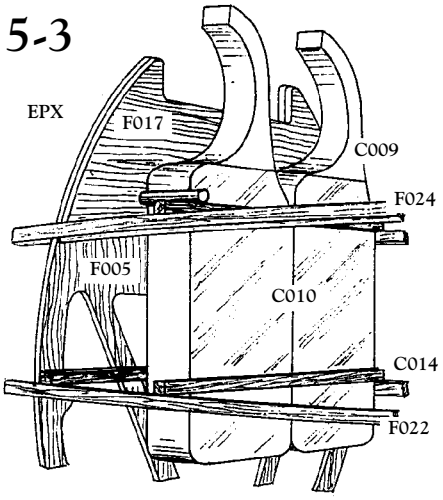


Fig. 5-4

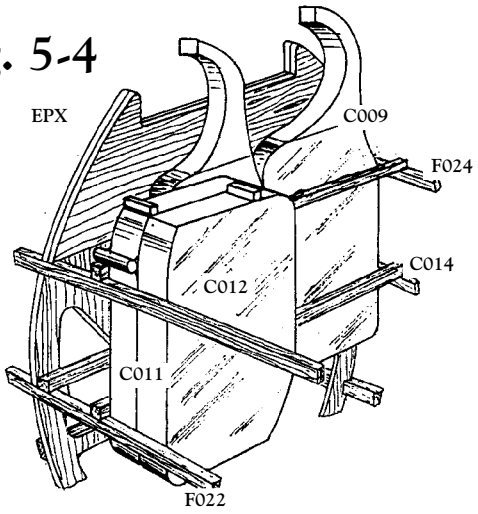


Fig. 5-5

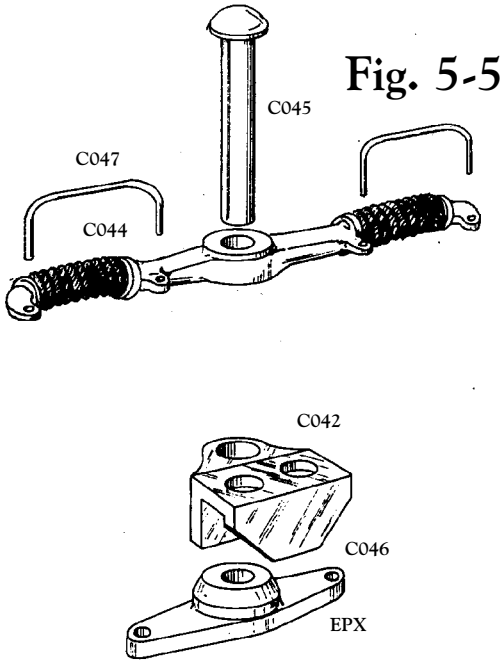


Fig. 5-6

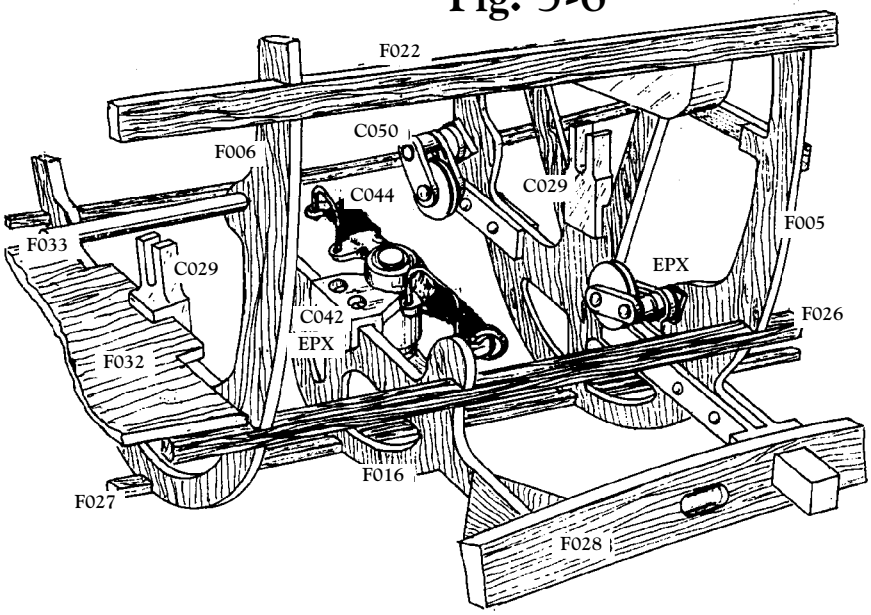


Fig. 5-7

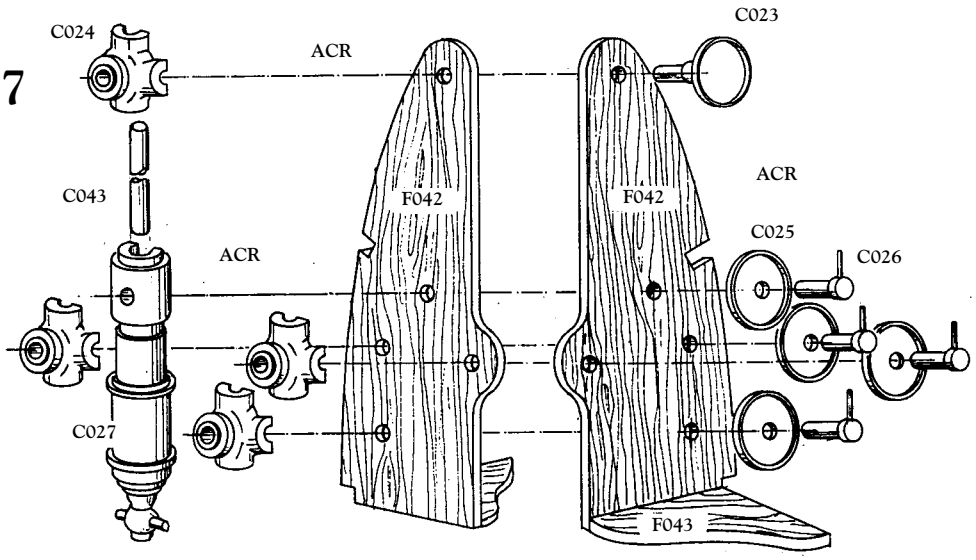
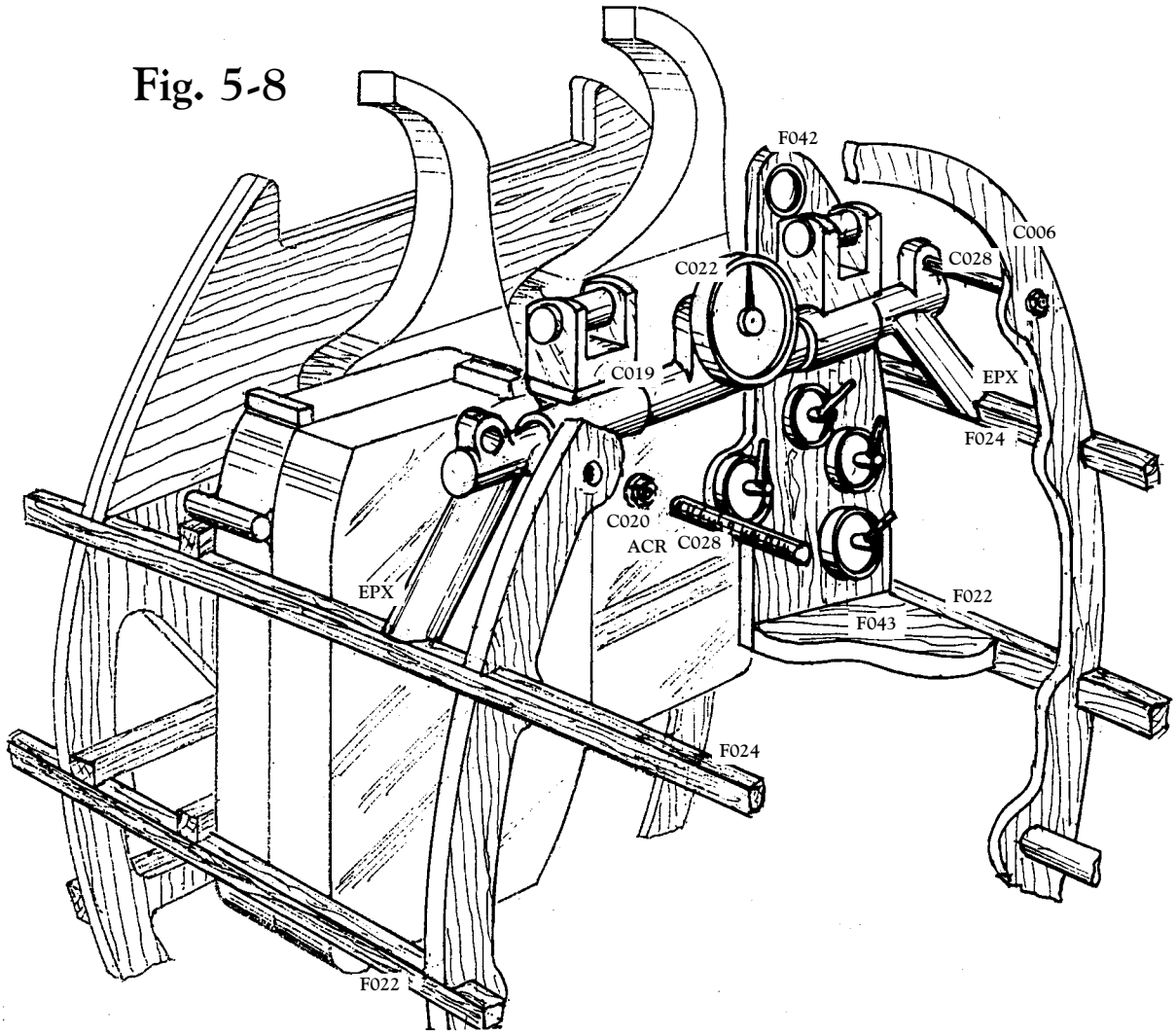

C024
ACR
C023
C043
F042
F042
ACR
C025
C026
ACR
C027
F043

Fig. 5-8


F042
C006
C028
C022
C019
EPX
F024
C020
ACR
C028
EPX
F022
F043
F024
F022

Stage 6: Installing More Fuselage Fittings, and Gun Assembly

Refer to Figure 6-1 to 6-9 and plan D004.

Parts List For Stage 6

C015	Rear gun sections	2-castings
C016	Gun barrels	2-castings
C017	Gun caps	2-castings
C018	Gun fire extinguishers	2-castings
C030	Lower bar control	1-casting + metal insert
C031	Fore pulley support	2-castings
C032	Double pulley	1-casting
C033	Aft pulley supports	2-castings
C034	Double pulley	1-casting
C035	Control column	1-casting+ metal insert
C036	Hand grips	1-casting
C037	Throttle	1-casting
C038	Control column fork	2-castings
C039	Sleeves	2-castings (half sleeve)
C040	Locking arm	1-casting + metal insert
C041	Locking arm handle	1-casting
C048	Aileron control crank	1-casting
C049	Bearings	3-castings (A016 and A017)
C051	Seat bottom	1-laser-cut part, 1 mm (3/64") thick
C052	Seat back	1-laser-cut part, 1 mm (3/64") thick
C054	Starting magneto	1-casting
C055	Crank for C054	1-casting
C056	Spark control	1-casting
C057	Auxiliary throttle handle	1-casting
C058	Magneto switch	1-casting
C059	Air pump	1-casting
C060	Fuel level gauge	1-casting
C061	Compass	1-casting
C062	Greaser	1-casting
C063	Mounting cross seat	4-castings (A016)
C064	Cockpit edge	1/8" hollow rubber tubing
C065	Seat cross rods	1.5 mm (1/16") dia. brass rod

General: Like Stage 5, this stage deals primarily with metal castings, except for the pilot seat.

Compass (C061): Glue the compass in place at the bottom of the cockpit as shown on plan D004. There is no sketch herein for this part.

More cockpit fittings: Install the greaser (C062), fuel level gauge (C060), and air pump (C059) as shown in Figure 6-1.

Glue the auxiliary throttle control (C057) to C019, the greaser (C062) and starting magneto and crank (C054 and 55) to bulkhead F006, and the magneto switch (C058) and spark control (C056) to the wood magneto panel (F060). See Figure 6-2.

Cockpit edge (C064): The cockpit edge is made from a length of black rubber tubing. After determining the length, join the ends by inserting a short piece of brass rod and glue.Tie the cockpit edge down with thread. See Figure 6-3. The rubber should be a dark brown to simulate leather, so you can paint it brown.

Pilot seat: Bend the seat back (C052) around the seat bottom (C051) and glue. Under the seat, install the two rods (C065). You need to cut the rod to length. At the ends of the rods insert the mounting fittings (C063). These are just false nuts.

Note: These fittings are to line up and attach to the seat rails (F033) at the sides of the fuselage. Wait until all the rigging to the controls is complete before you install the seat.

Machine guns: Assemble the two guns using parts C015, C016, C017, and C018 as shown in Figure 6-5. Make sure you line up the brackets on C015 and C016.

Note: The guns will be installed onto the front and rear gun supports (C019 and 21), but hold off and install after the engine has been installed in the fuselage.

Control column: The control column is made of of the following parts: handgrips (C036), throttle (C037), sleeve (C039), locking arm and handle (C040,41), control column (C035), bearing (C049), lower bar (C030), aileron control crank (C048), fore and aft pulley supports and pulleys (C031,32,33, and 34), and the column control fork and pivot (C038). Figure 6-6 illustrates the parts, and Figure 6-7 shows it assembled.

The bearing, C049, is made up of a false nut and false screw as shown on Figure 6-6.

Install the unit into the two supports C029 already installed in the cockpit area. See plan sheet D004, but do not glue it in if you want to be able to move the control column. Pinch the top of C029 together with pliers so the bar will rotate but not fall out of the supports.

Note: Rudder, aileron, and elevator cables: Before installing the control column and rudder foot pedals (stage 5), it may be wise to attach the control wires to the units beforehand. Figure 6-8 and 6-9 show the wire connections. Leave enough line and some excess for the entire rigging.

Fig. 6-1

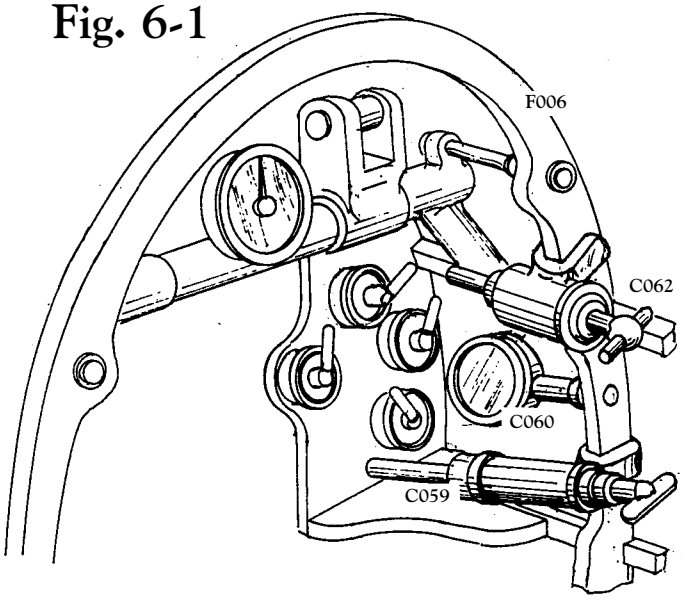


Fig. 6-2

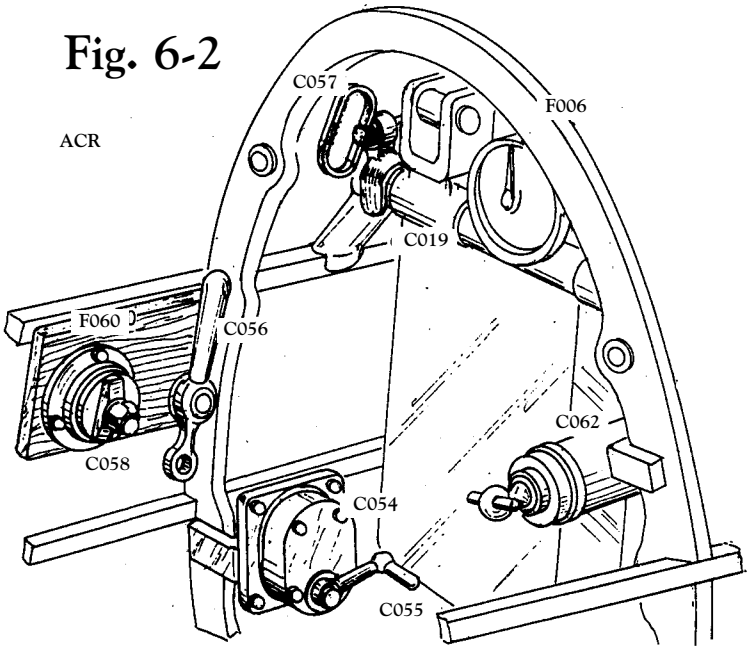


Fig. 6-3

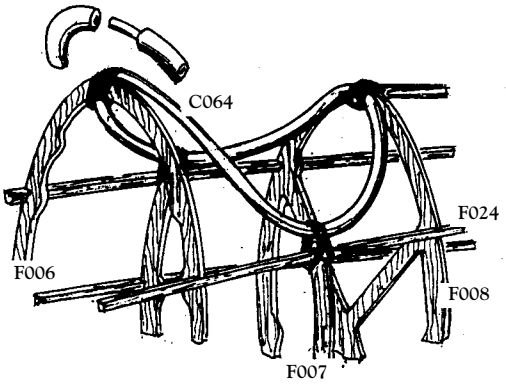


Fig. 6-4

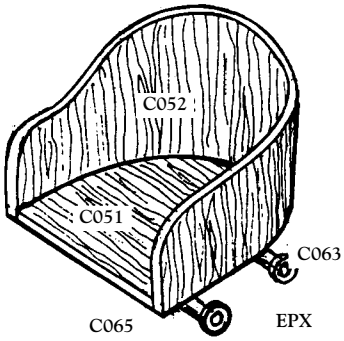


Fig. 6-5

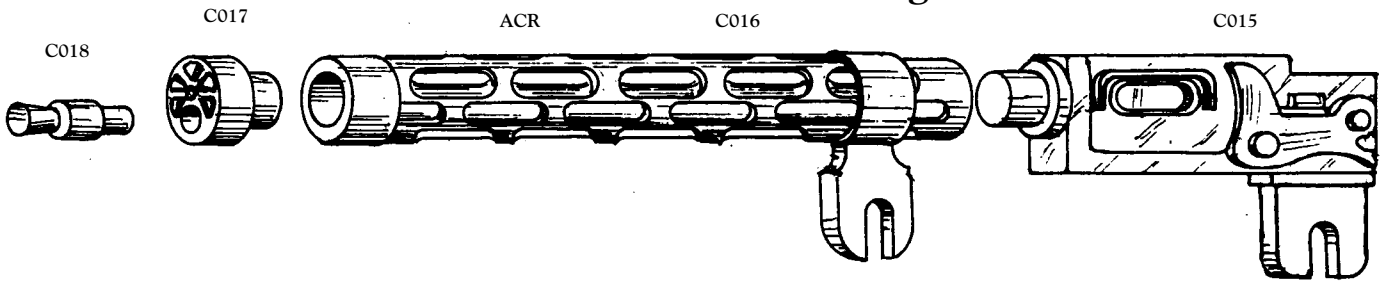


Fig. 6-6

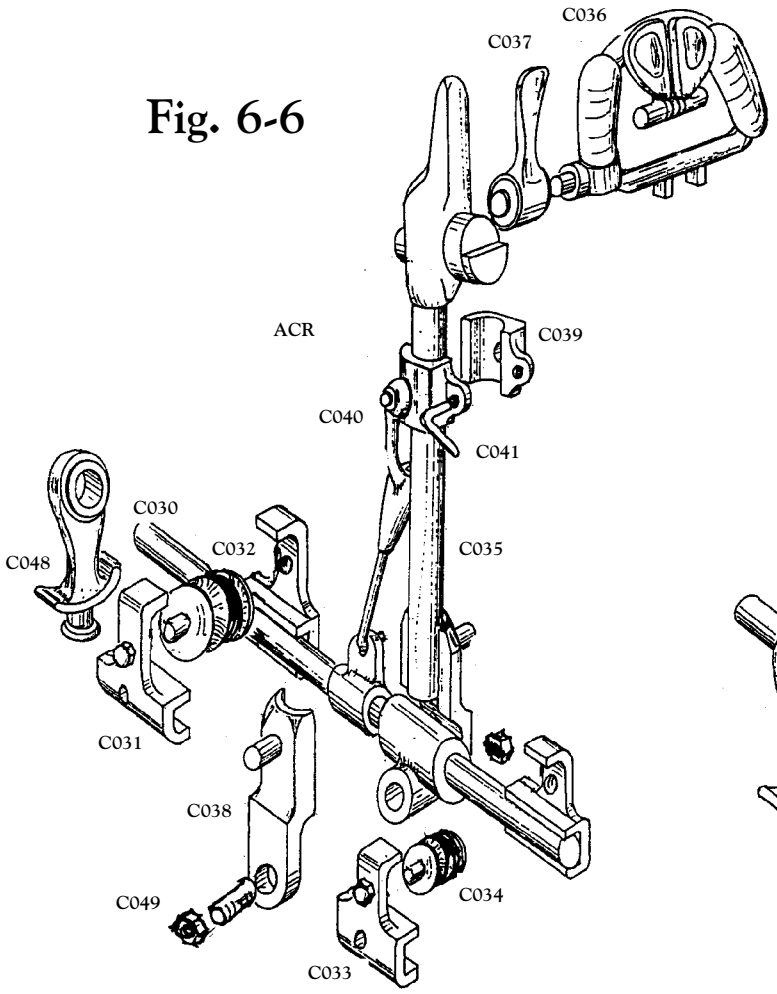


Fig. 6-7

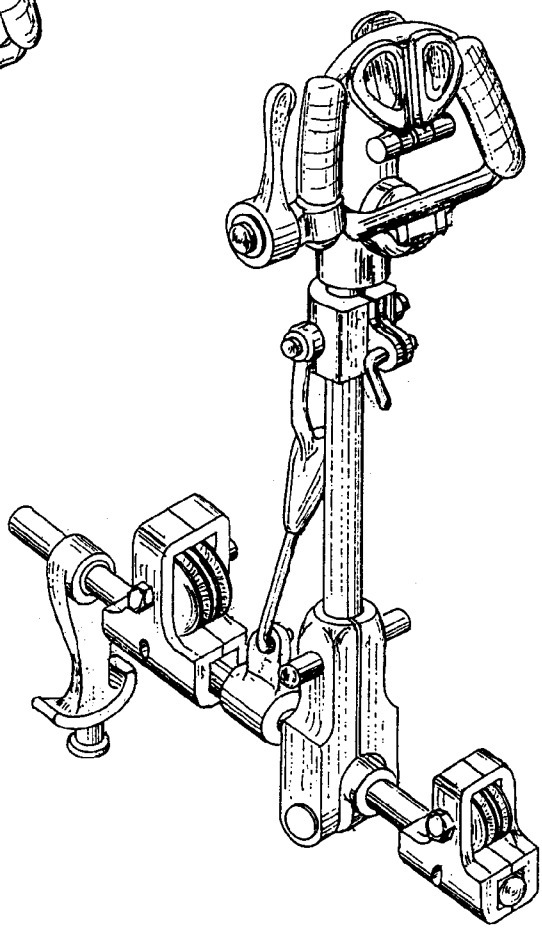


Fig. 6-8

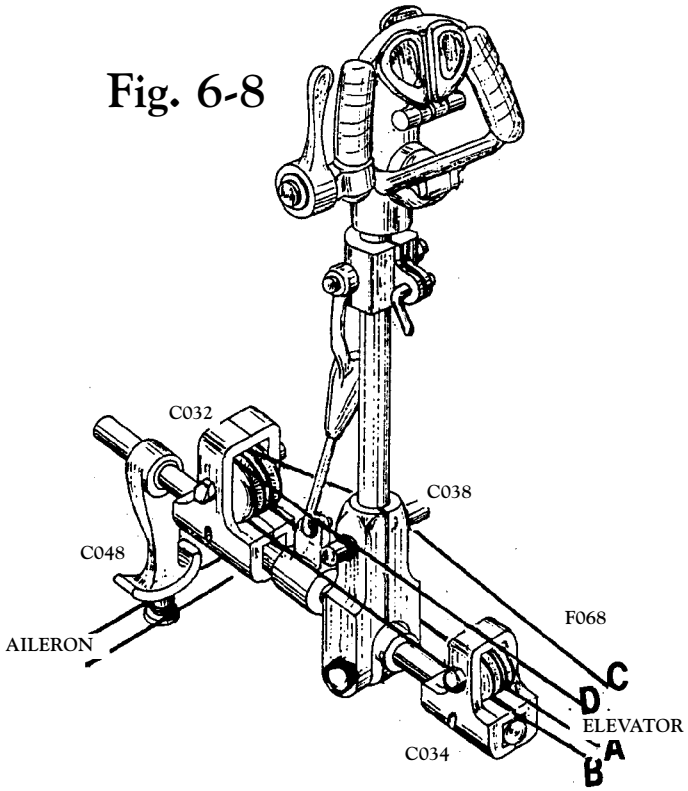
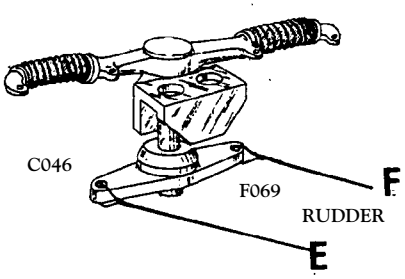


Fig. 6-9



Stage 7: Installing The Stabilizer, Elevator, Rudder, & Control Cable

Parts List For Stage 7

Refer to Figure 7-1 to 7-4 and Plan D004

F055	Elevator cranks	2-castings
F056	Elevator/ rudder hinges	Self adhesive aluminum tape
F058	Rudder	1-casting
F059	Rudder crank	1-casting
F061	Elevator joint strip	1.5 x 3mm (1/16 x 1/8") wood strip
F067	Turnbuckles	6-castings (W042)
F068/69	Elevator/rudder control cables	0.25 mm (0.010") dia gray nylon cord

General: This stage assumes you have already hooked up the control cables in the cockpit area, so the cables can now be attached at the rudder and elevator cranks.

Installing the rudder: Glue the rudder crank (F059) to the rudder casting (F058). Install the rudder on the fin using the rudder hinges (F056). Cut the aluminum tape as needed. See Figure 7-1.

Installing the stabilizer: The two stabilizer sections set aside earlier can now be installed as shown in Figure 7-2. Glue to the ribs on the fuselage. Careful to align level. On the back edge of the stabilizer, clamp a rod or dowel to help hold the stabilizer straight. Insert the wood strip joint support (F061) over the stabilizer center joint at the back edge and glue in place.

Installing the elevator: Glue the two elevator cranks (F055) to the elevator casting (F054). Then, install the elevator like you did the rudder with the tin hinges (F056). Plan D004 shows the locations of the hinges. See Figure 7-3.

Control rigging: Note on plan D004 that the control rigging (F068 and 69) from the cockpit reverses itself going back to the rudder and elevator cranks. This is shown by A, B, C, D, E, and F notations on the lines in Figure 6-8 and 6-9 of stage 6, and Figure 7-4 here in stage 7. All six lines have a turnbuckle (F067) inserted in the lines about 9 centimeters (3-1/2") from the elevator cranks. Pull all control lines up tight and seize to the cranks. Check the movement of the controls in the cockpit to see that the rudder and elevator will move freely. If you do not want the rudder and elevator to move, you can add a touch of glue anywhere on the parts to prevent such movement.

Fig. 7-1

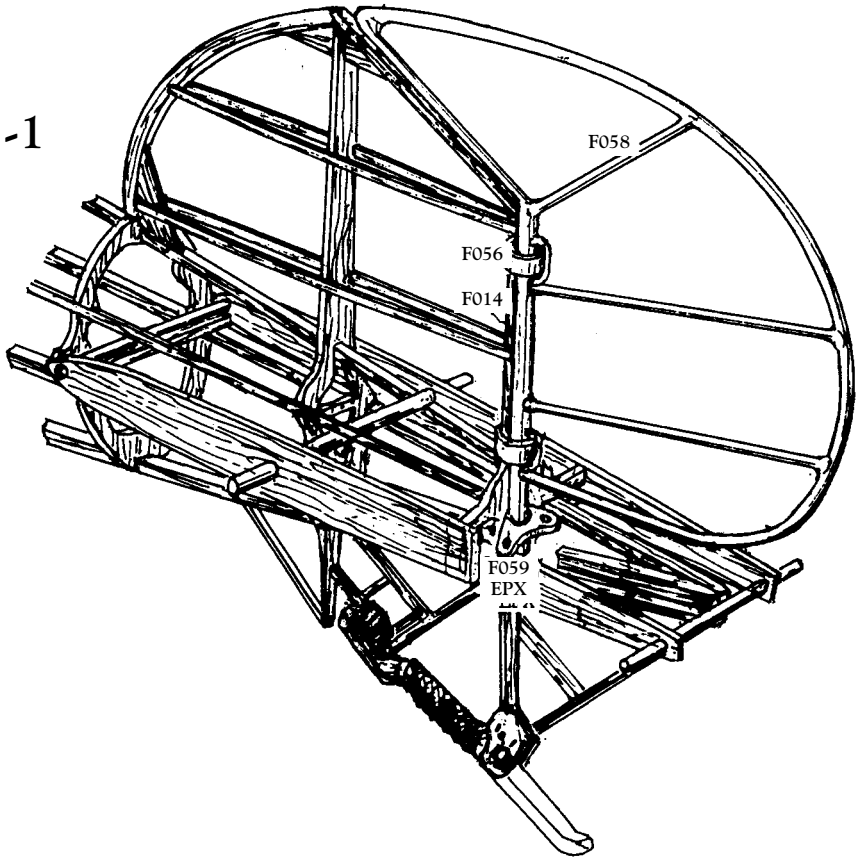


Fig. 7-2

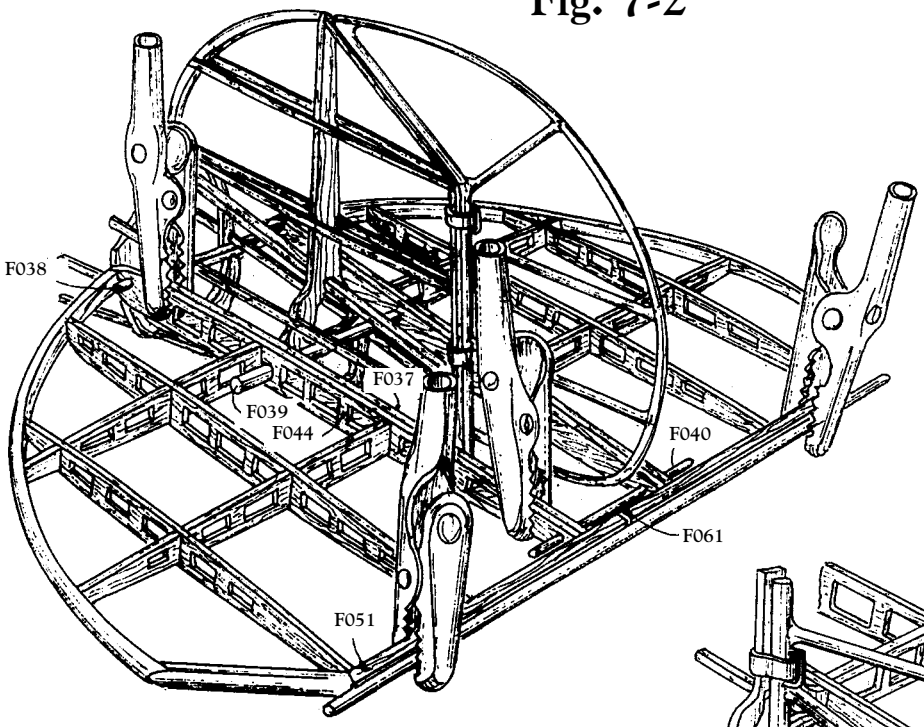
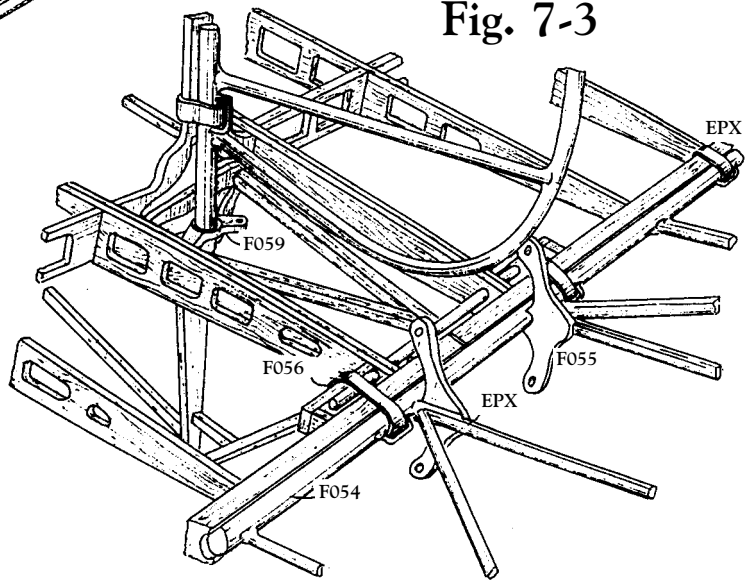


Fig. 7-3



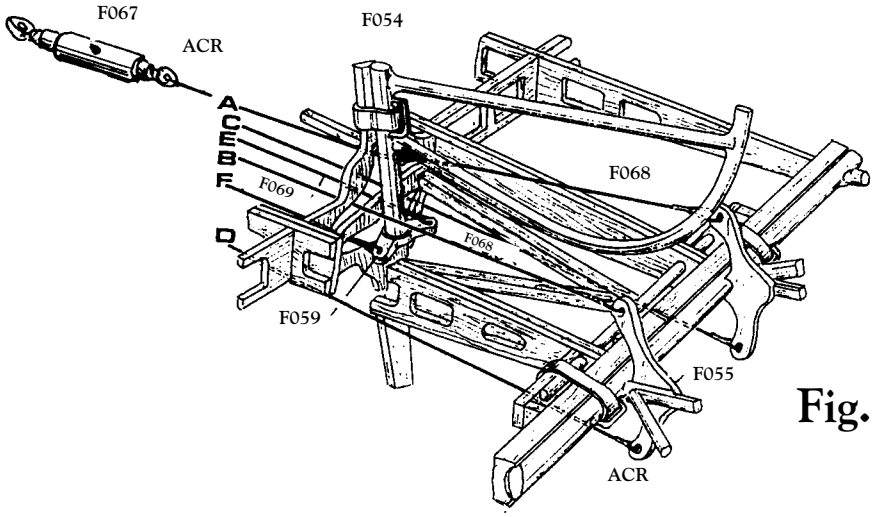


Fig. 7-4

Stage 8: Building and Installing the Landing Gear

Refer to Figure 8-1 to 8-9 and plan D002 and D004.

Parts List For Stage 8

A001	Axle	4 mm (5/32") dia. aluminum tubing
A002	Bearing	2-castings
A003	Joint	4-castings
A004	Landing gear struts	2-castings
A005	Landing gear strut sleeve	3/32" x 5/16" (2 x 8 mm) aluminum tube
A006	Spreader bar sleeve	2-castings (A016)
A007	Spreader bar	1 mm (3/64") dia. steel rod
A008	Shock absorber	White Nylon cord, 1.5 mm (1/16") dia.
A009	Cross wires	0.25 mm (0.010") dia.nylon cord
A010	Turnbuckles	2-castings (W042)
A011	External wheel disk	2-castings
A012	Internal wheel disks	2-castings
A013	Tires	2-rubber castings
A014	Wheel locks	2-castings

Setting the axle: The front laser-cut stand holding the fuselage has notches in the legs as shown in Figure 8-1. Make sure the stand is properly located (see plan D002). Insert the bearings (A002) on the axle (A001) and set the axle in the stand slots.

Joints at fuselage: Glue the four castings (A003) to the fuselage as shown in Figure 8-2. Joints are located at bulkheads F003 and F006 in way of longeron F026.

Installing the struts: On the ends of the landing gear struts (A004), slide on the four sleeves (A005). Don't glue at first until adjustments have been made. The sleeve will mate with the joints on the fuselage. Locate the struts under each of the bearings on the axle, then slide the strut and sleeves onto the joints. See Figure 8-3, 8-4, and 8-5. Glue the joints with epoxy.

Spreader bar: Install the spreader bar (A007) with two sleeves (A006)at the ends through the holes in the struts back of the axle.

Shock cord and cross wires: Before installing the shock cord, glue the bearings (A002) in place. You can also glue the axle to struts, but it's not necessary as the cord will hold it in place. Wrap the nylon cord (simulating an elastic cord) (A008) around the axle (A004) as shown in Figure 8-7. This acts as the shock absorber for the gear. The cross wires go from the spreader bar to the top of the strut as shown in Figure 8-8. Use a turnbuckle ((A010) at the lower ends of the cross wire.

Wheels: Figure 8-9 illustrates the wheel parts: an internal disk (A012), external disk (A011), the rubber tire (A013), and a wheel lock (A014). Assemble the wheels, then install the wheels, making sure they turn freely before adding the wheel locks.

Fig. 8-1

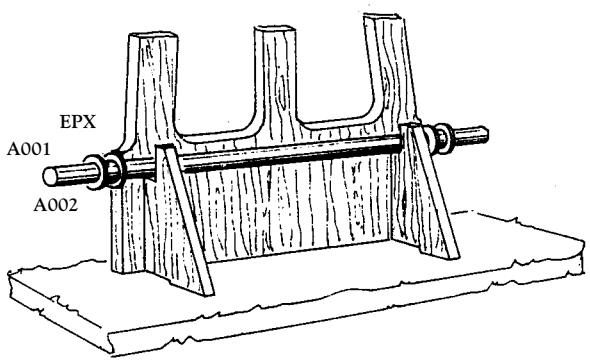


Fig. 8-2

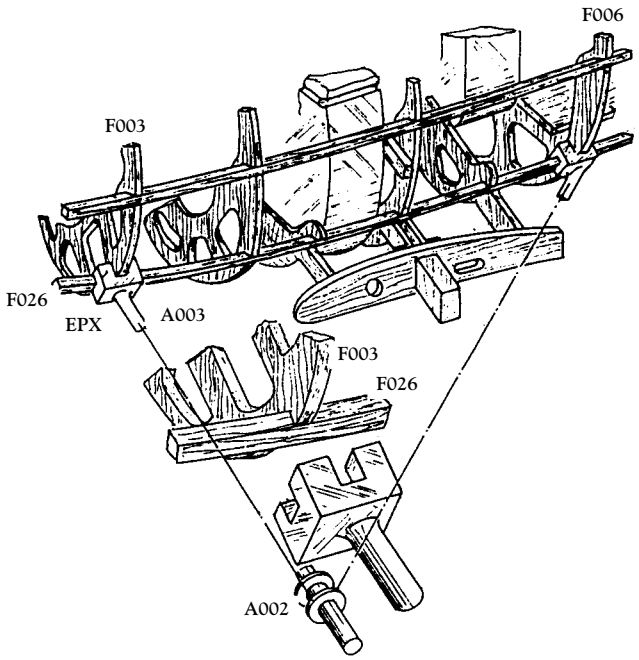


Fig. 8-3

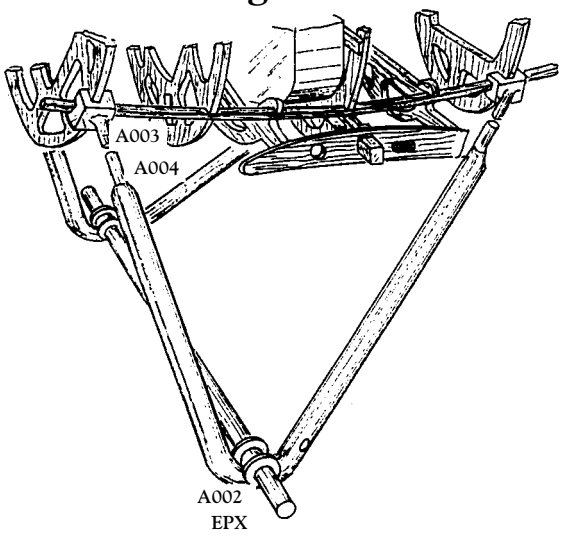


Fig. 8-4

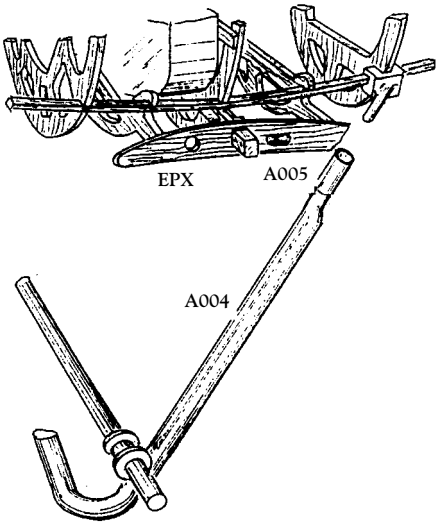


Fig. 8-5

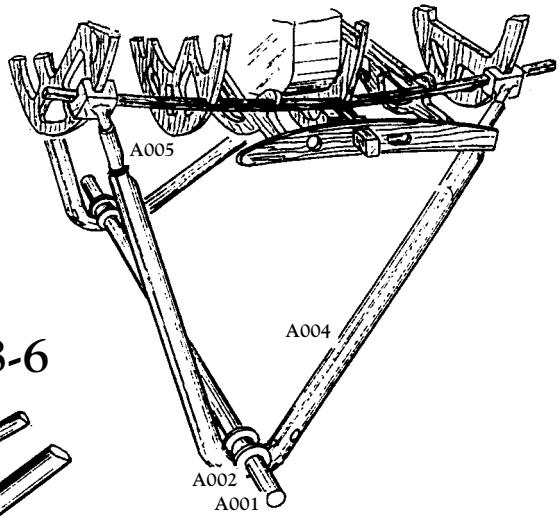


Fig. 8-9

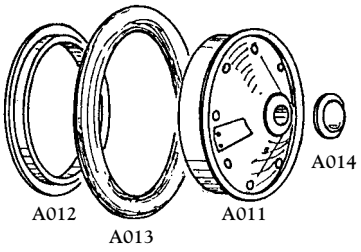


Fig. 8-6

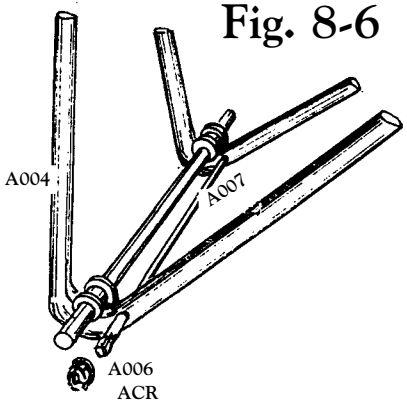
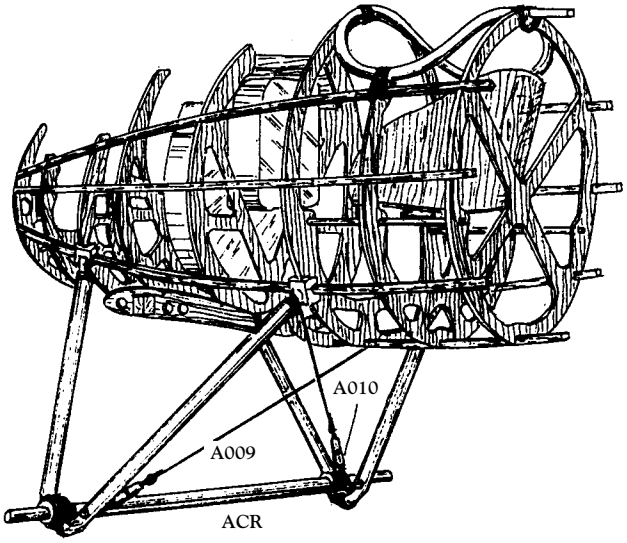


Fig. 8-8



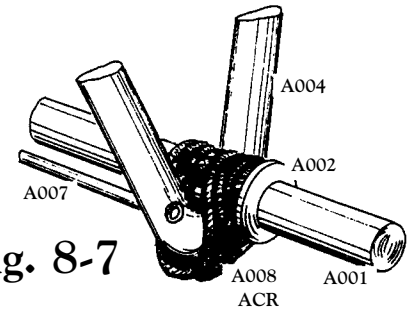


Fig. 8-7

Stage 9: Assembly of the Mercedes 180 HP Motor and Propeller

The real Mercedes motor had 6 cylinders in line, was water-cooled, and was a most reliable engine. The model motor has a large number of castings, but is relatively easy to assemble. Assembly has been broken down into several intermediate stages for clarity. Epoxy and super glue is intended as an adhesive for the various castings. As you proceed, pre-fit parts before applying glue.

For all motor stages, refer to the scale drawing DM01, included in these instructions, and the sketches noted in each stage.

Stage 1M

Refer to Figure 9-1 to 9-5.

Parts List For Stage 1M

M001	Upper block	1-casting
M002	False screws	4-castings (A017)
M003	False nuts	8-castings (A016)
M004	Shaft support	1-casting
M005	Lower block	1-casting
M006	Propeller shaft	1-casting (with M009)
M007	Propeller flange	2-castings
M008	Cylinders	6-castings
M009	Shaft rear flange	1-casting (with M006)
M010	Stirrups	14-castings
M013	Sleeves	10-castings
M020	Oil pump	1-casting
M021	Water pump filter	1-casting
M022	Water pump	1-casting
M025	Vents	2-castings
M026	Tube	1-casting
M033	Propeller nut	1-steel nut
M038	Tube	1-casting

Propeller shaft: Assemble the shaft and supports as shown in Figure 9-1. Parts M033, M007, M006, M007, M004, and M009 are required. Do not glue the shaft to M004 so the shaft is free to rotate. The flange M009 prevents the shaft from coming out. The propeller can be added later, held on by the nut M033.

Motor block: On the lower block (M005), install the oil pump (M020), and the water pump (M021, M022, and M026) at the bottom of the lower block as shown in Figure 9-2. Assembled views can also be seen in Figure 9-4 and 9-5.

Glue the upper block (M001) and lower block (M005) together and install the four false screws (M002) and the eight false nuts (M003). See Figure 9-2.

Glue the propeller shaft assembly to the blocks taking care not to get glue on the shaft and flange. Check to make sure the shaft rotates freely. See Figure 9-4.

Cylinders: See Figure 9-2, 9-4, and 9-5. The six cylinders (M008) are all identical. Connect together using the couplings (M013) at top and bottom of the cylinders. Insert the cylinders in the block holes, then add the fourteen stirrups (M010), seven on each side in the holes in the upper block casting.

The cylinders and pumps are shown in section in Figure 9-3.

Pipe and vents: On the right side looking forward install the tube (M038) between the two blocks and add the two vents (M025) as shown in Figure 9-5.

At this stage it would be advisable to make a wooden stand to hold the engine while you complete the assembly.

Fig. 9-1

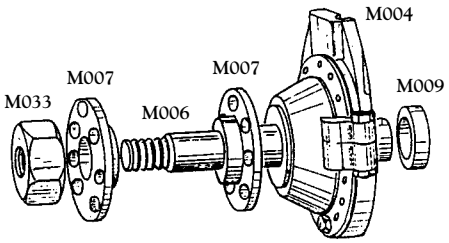
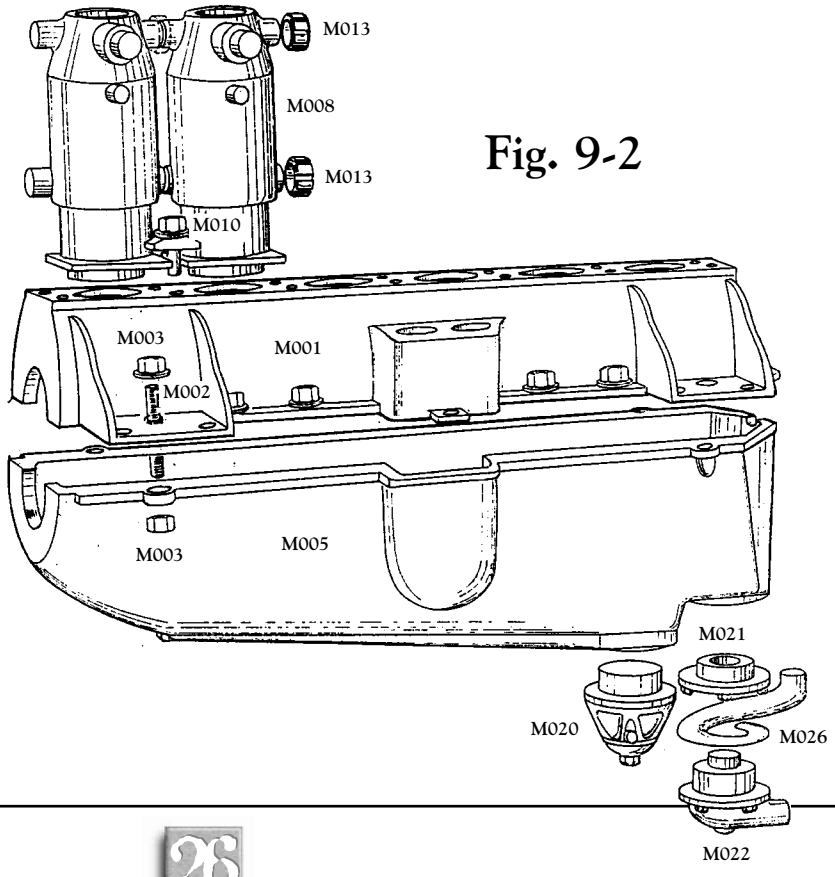


Fig. 9-2



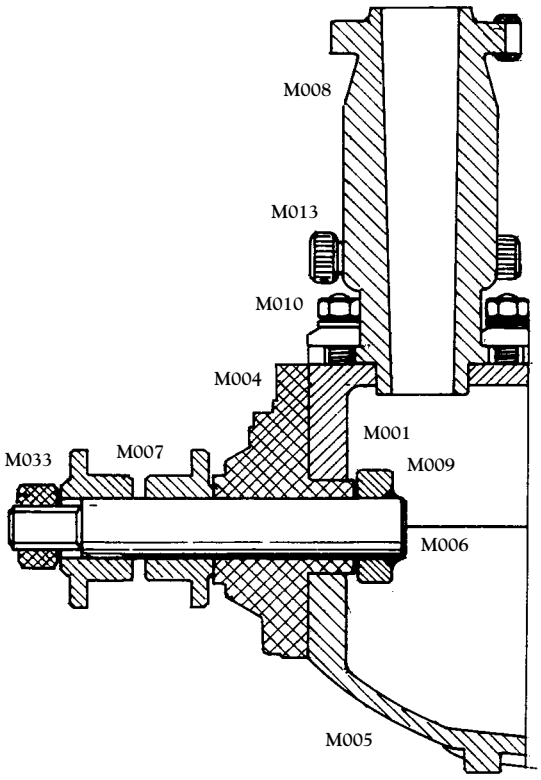
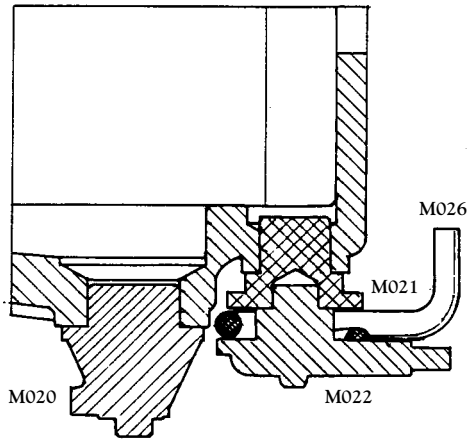


Fig. 9-3



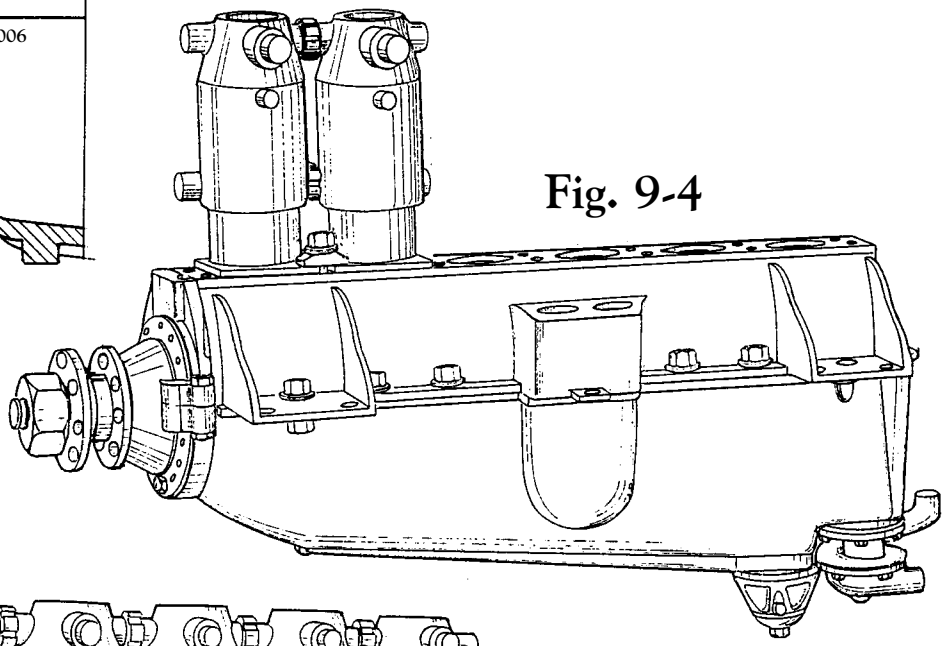
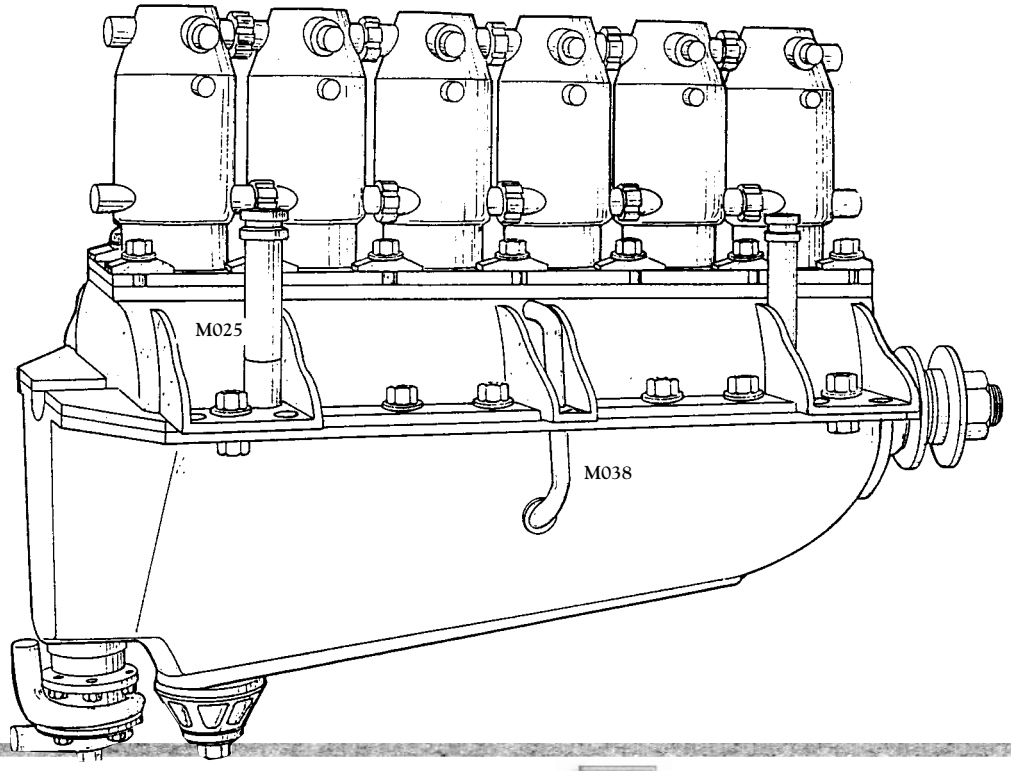


Fig. 9-4

Fig. 9-5



Stage 9 Continued : Assembly of the Mercedes 180 HP Motor and Propeller

Stage 2M

Refer to Figure 9-6 to 9-12.

Parts List For Stage 2M

M014	Base box	6-castings
M015	Rocker boxes	6-castings
M016	Valve springs	cast with M015
M017	Camshaft	2.5 mm (3/32") dia. aluminum tubing
M018	Front box	1-casting
M019	Rear cover	1-casting
M023	Rear bracket	1-casting
M024	Transmission	1-casting
M027	Cylinder pump tube	1-casting
M028	Sleeves	2-castings (M013)
M031	Tubes	1 mm (3/64") dia. brass rod

See Figure 9-10 for a longitudinal section of the camshaft and other components.

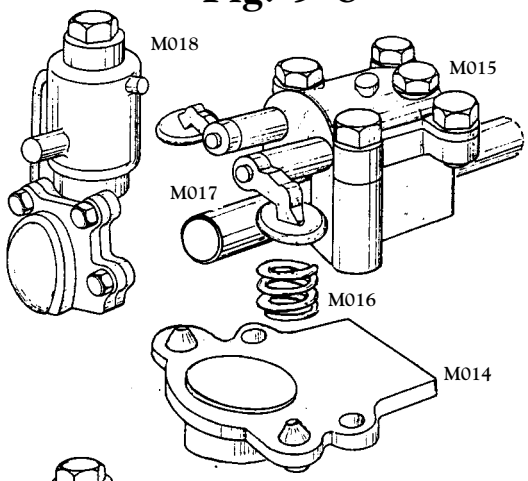
Water pump pipe: Add the pipe (M027), bending as shown in Figure 9-12. The pipe connects with sleeves (M028) to the last cylinder and to the water pump tubing (M026) at bottom of the motor as shown in the figure.

Valve assembly and camshaft: First, assemble the six rocker assemblies made up of parts M014 and M015/M016. See Figure 9-6. Mount each on top of the six cylinders.

Cut to length and slide in the camshaft (M017) through the holes in the rocker. Add the front box (M018) as shown in Figure 9-6 and 9-7. Install the two tubes (M031) from the front box down to the block as shown in Figure 9-8.

Transmission: At the rear of the motor, assemble and install the transmission, parts M024, M023, and M0-19. See Figure 9-9 and 9-11.

Fig. 9-6



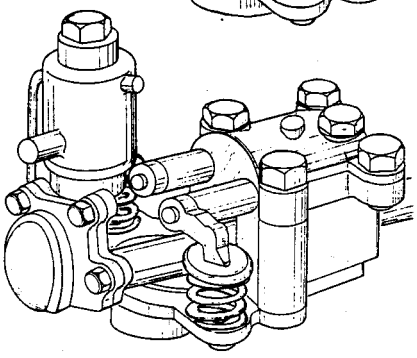


Fig. 9-7

Fig. 9-8

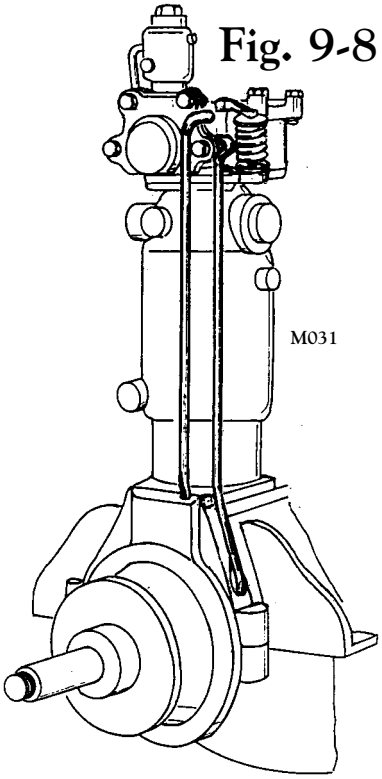
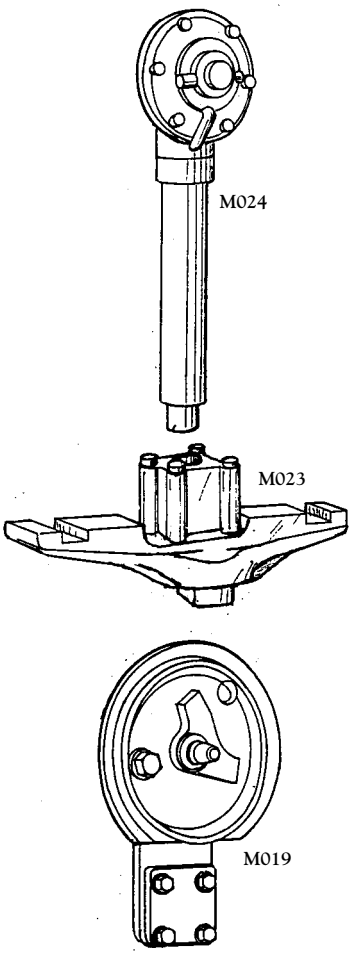
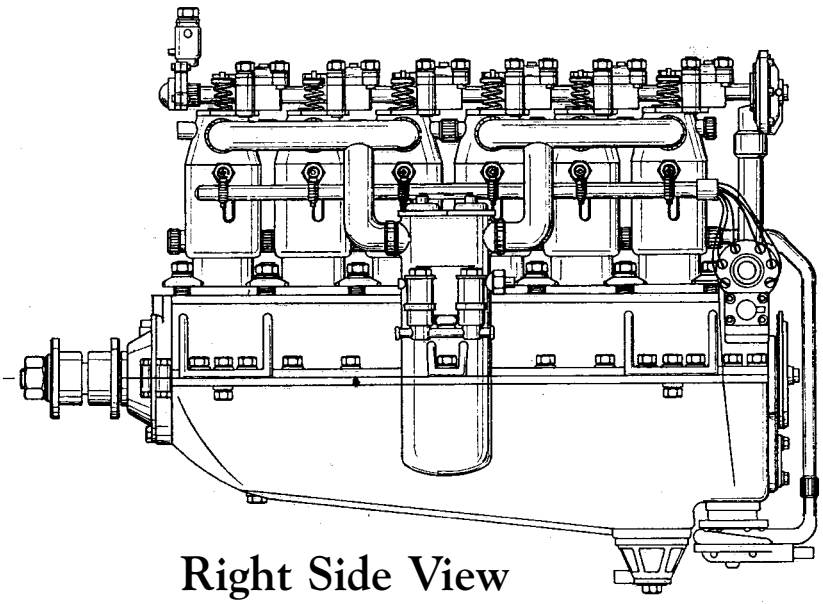
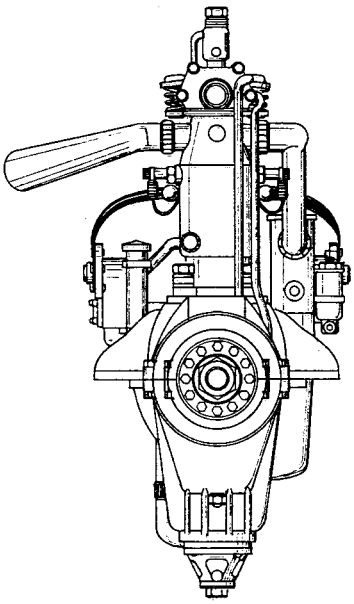


Fig. 9-9

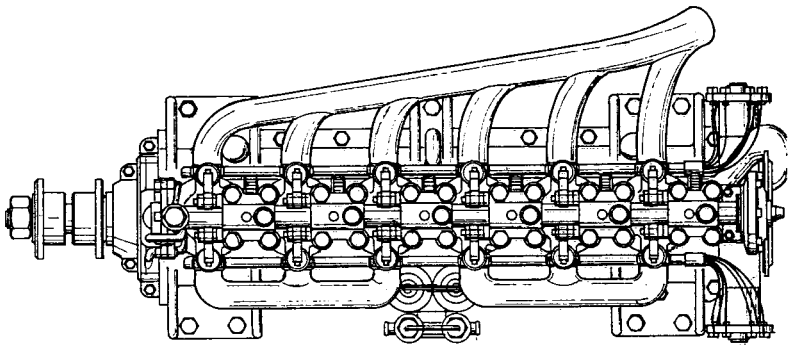




Right Side View

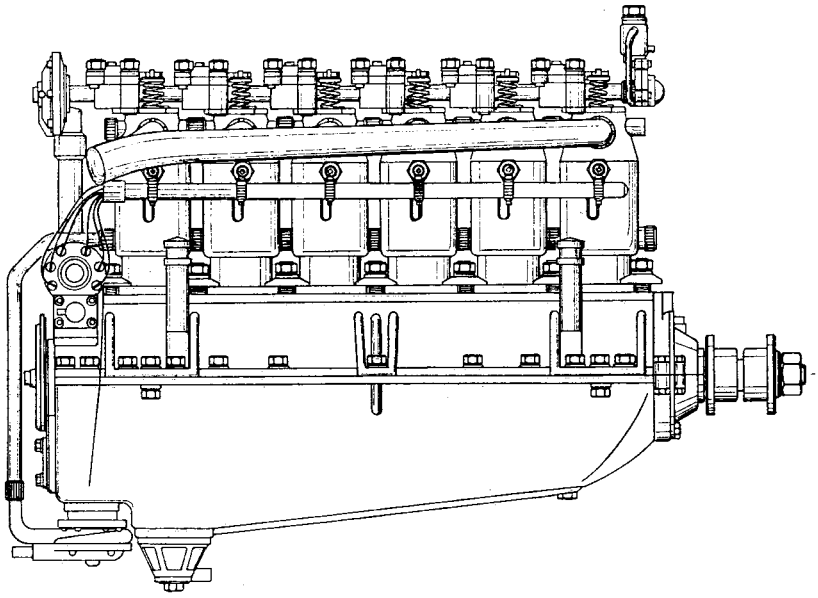


Front View

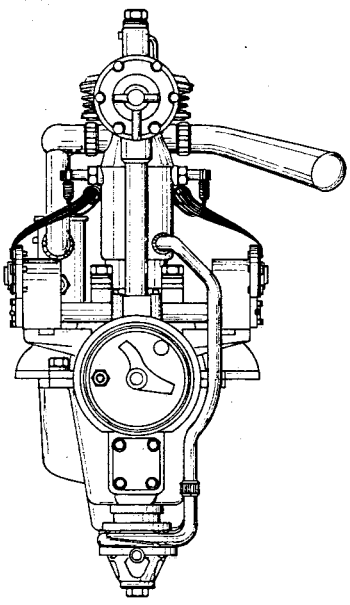


Top View

Mercedes 180 HP Motor
PLAN DM01



Left Side View



Rear View

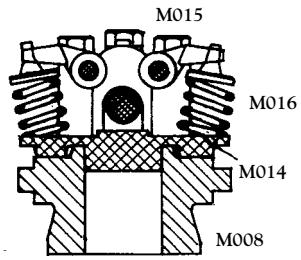
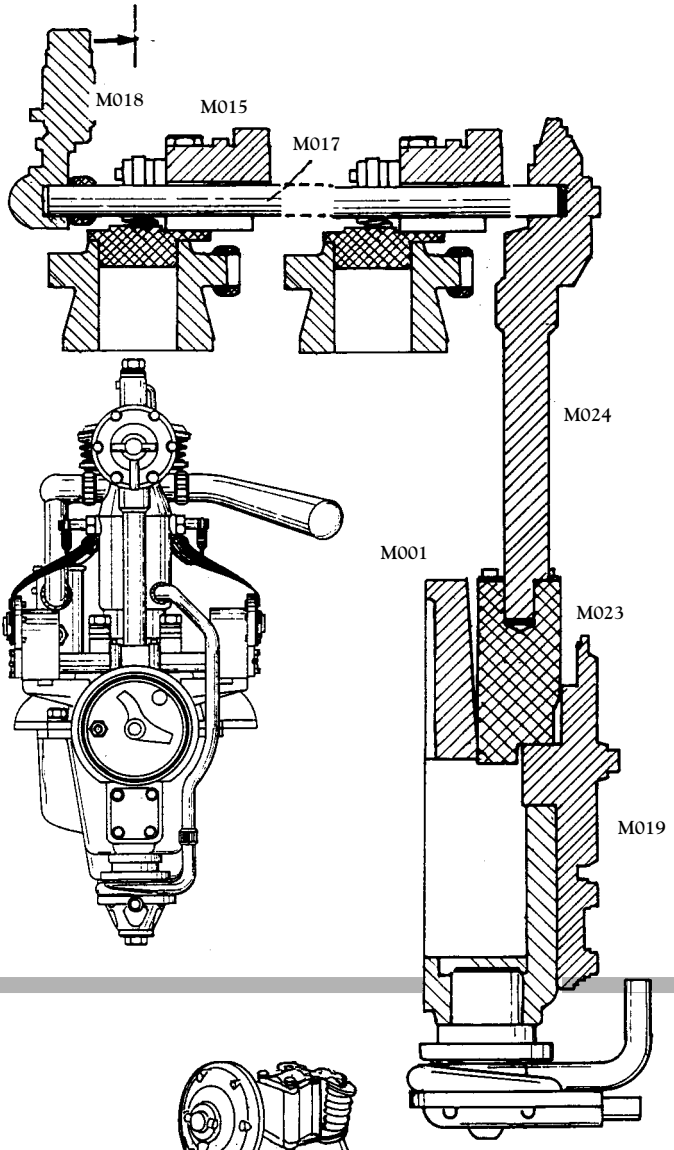
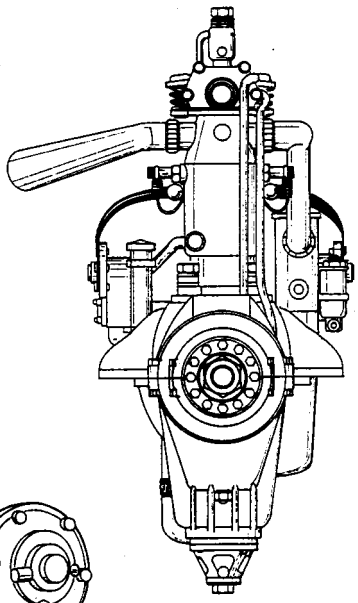


Fig. 9-10





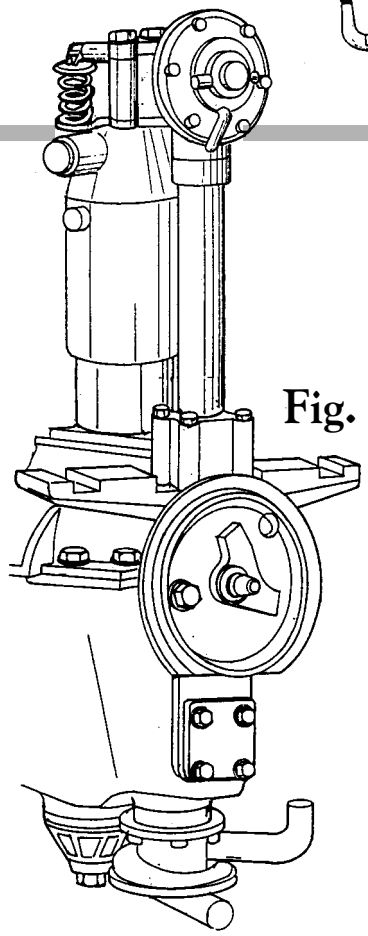


Fig. 9-11

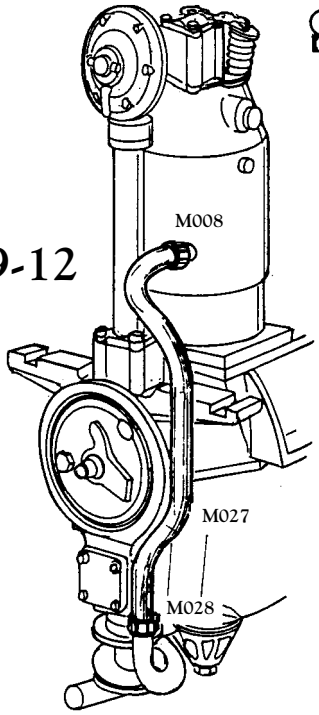


Fig. 9-12

Stage 9 Continued : Assembly of the Mercedes 180 HP Motor and Propeller

Parts List For **Stage 3M**

Refer to Figure 9-13 to 9-15.

M011	Carburetor	1-casting
M012	Two barrel carb	1-casting
M034	Induction pipes	2-castings
M035	Induction pipes	2-castings
M037	Sleeves	12-castings

Carburetor: Glue the two-barrel carburetor (M012) to the side of the carburetor (M011) and the assembly onto the upper block on the right side looking aft. See Figure 9-13, 9-14, and 9-15.

Induction pipes: Glue the induction pipes (M034 and M035) to the cylinders and carburetor using the sleeves (M037) as shown in Figure 9-13 and 9-14. M035 glues directly to M034. File the ends if necessary so it fits together smoothly.

Fig. 9-13

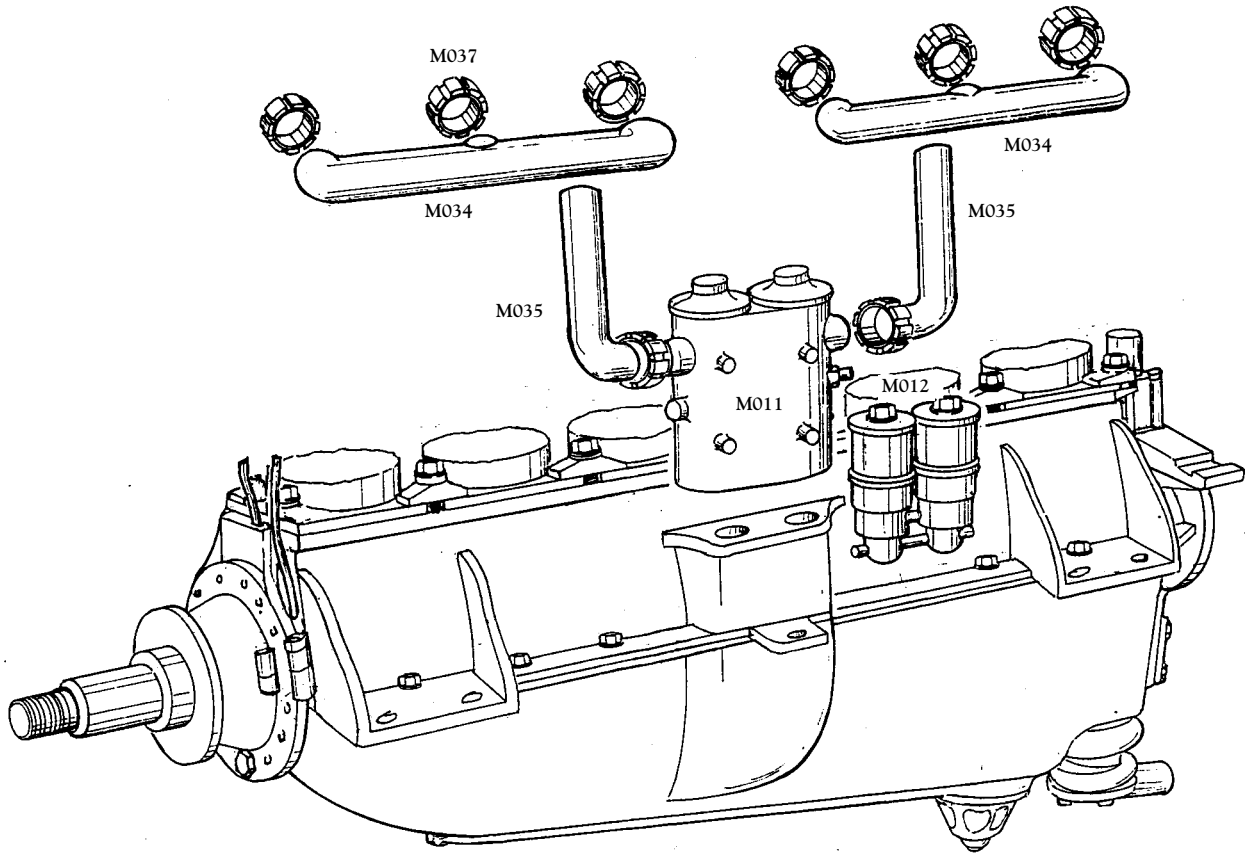
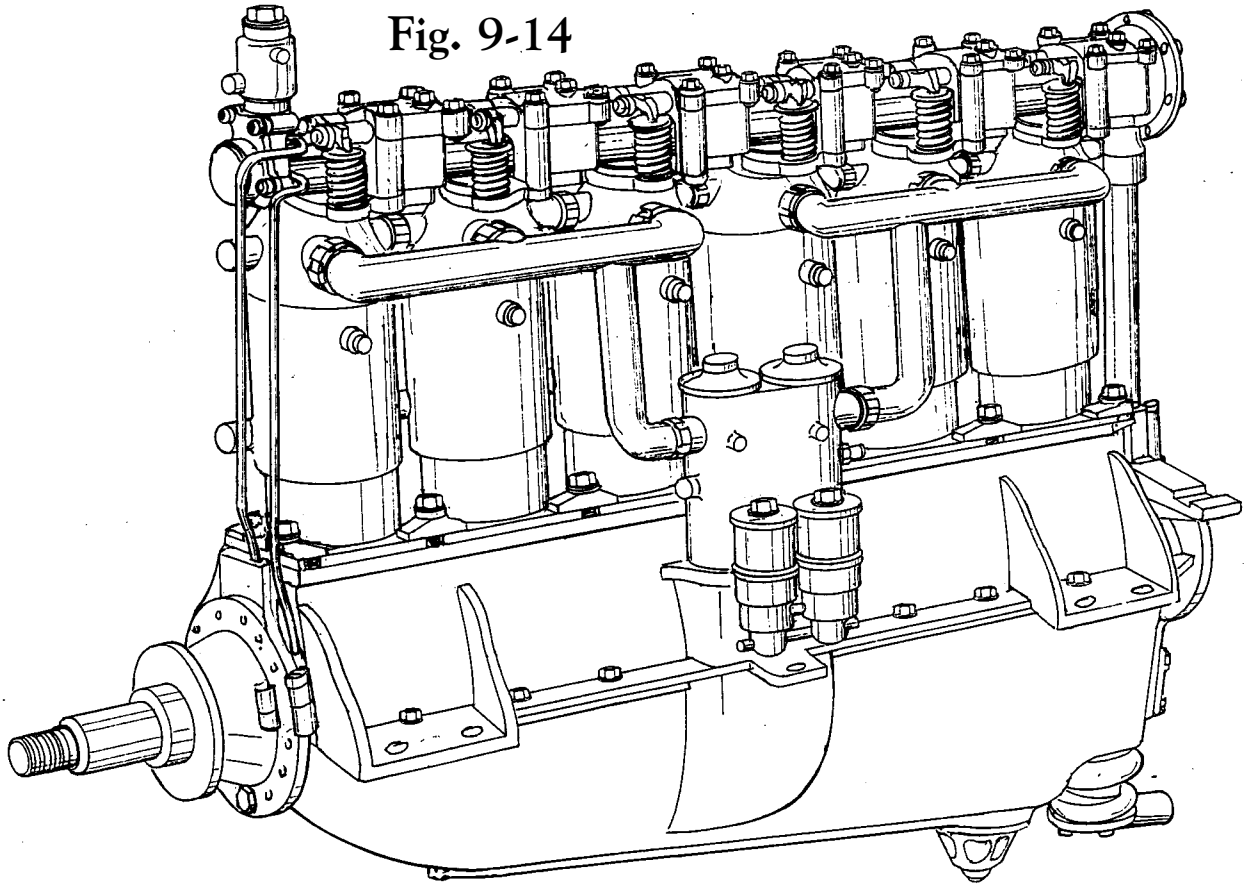


Fig. 9-14



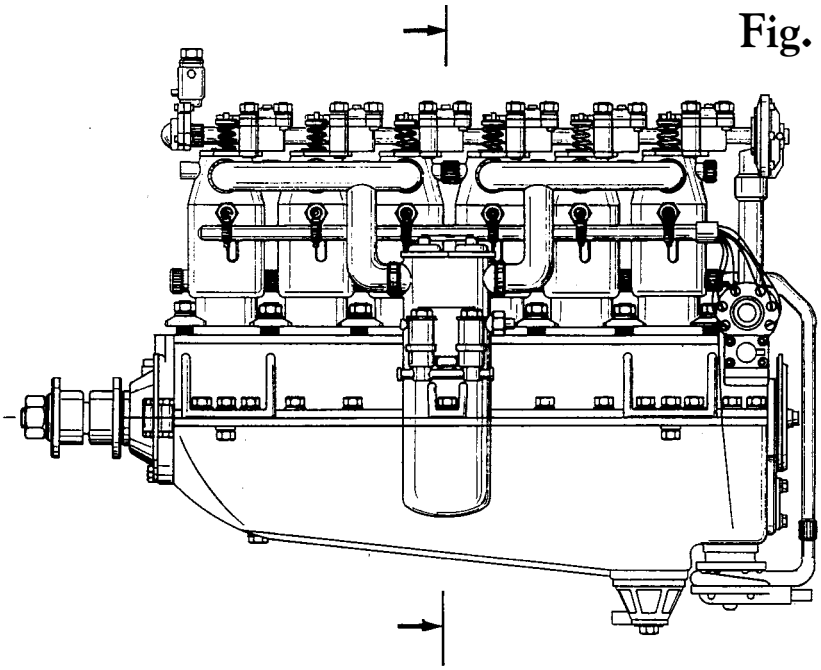
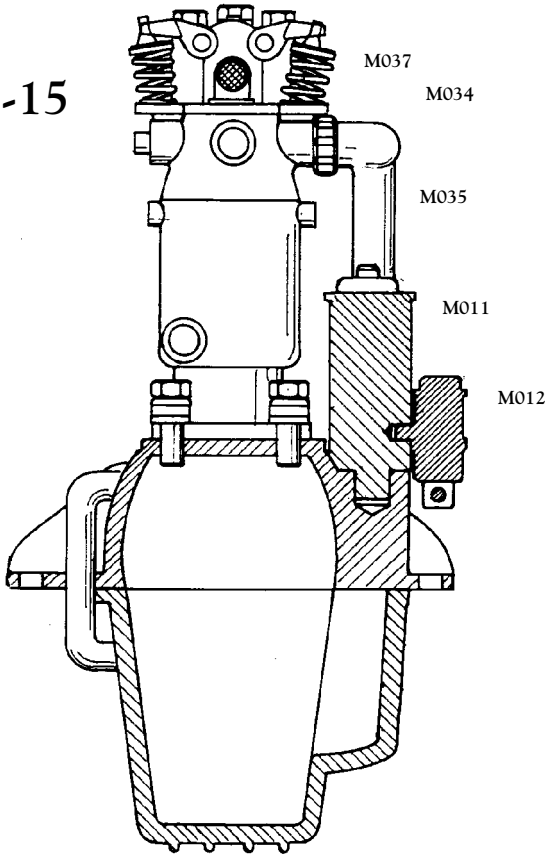


Fig. 9-15



Stage 9 Continued : Assembly of the Mercedes 180 HP Motor and Propeller

Stage 4M

Refer to Figure 9-16 to 9-18.

Parts List For Stage 4M

M029	Magnetos	2-castings
M030	Spark plugs	12-castings with cable
M039	Tube	2.5 mm (3/32") dia. aluminum tubing
M040	Sleeve	2-castings
M041	Magneto cable	0.5 mm (0.021") dia. copper wire

Magnetos: Add the magnetos (M029) on each side of the motor on bracket M023 as shown in Figure 9-16. Glue the tubing (M039) that carries wires to the plugs on both sides of the cylinders below the spark plug locations.

Spark plug and wires: Glue the spark plugs (M030) in the cylinders. Using the copper wire (M041), shape the wires at the magnetos and glue in the positions as shown in Figure 9-17, run into the end of tube M039. Glue spark plug wires to the underside of the tubing.
See Figure 9-18.

Fig. 9-16

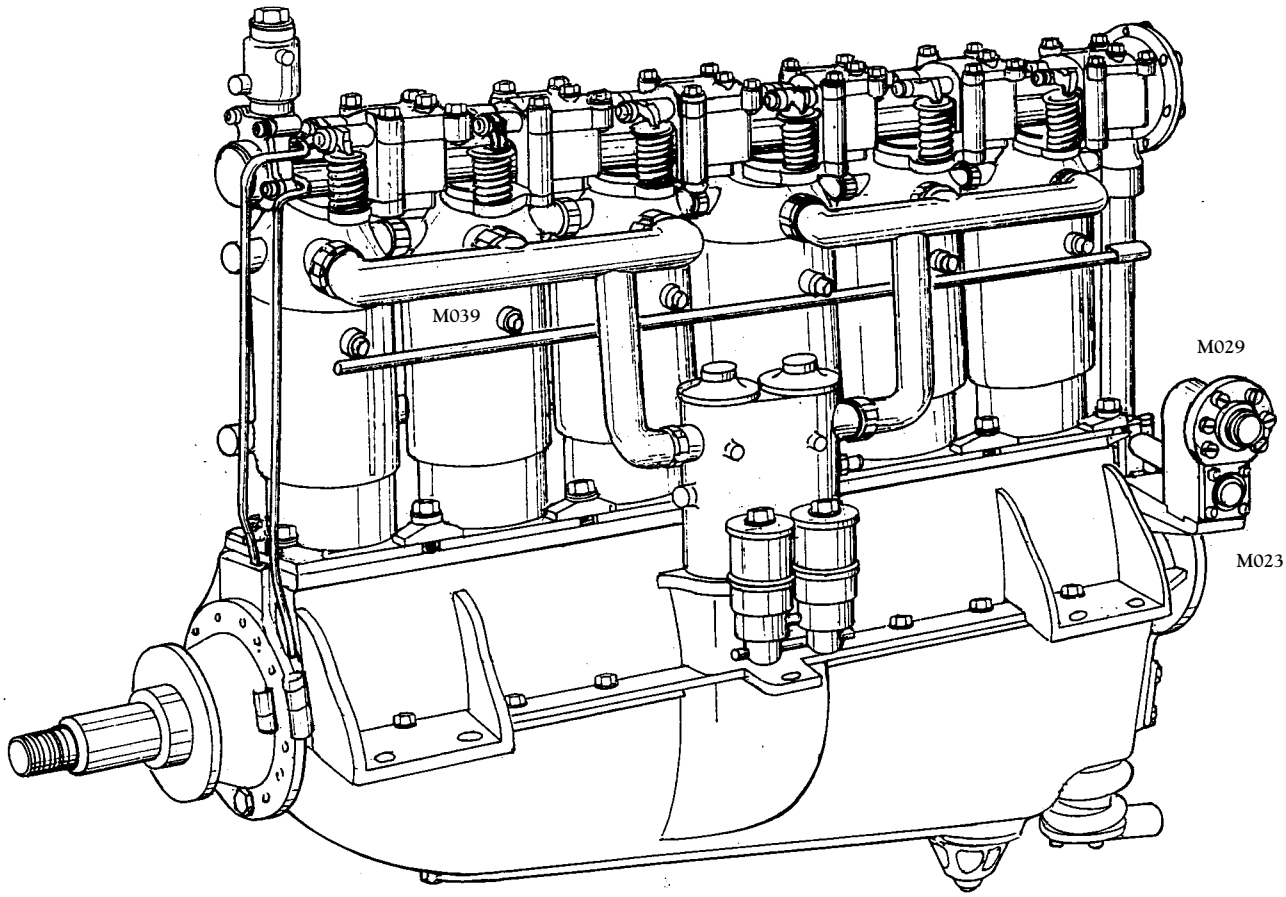
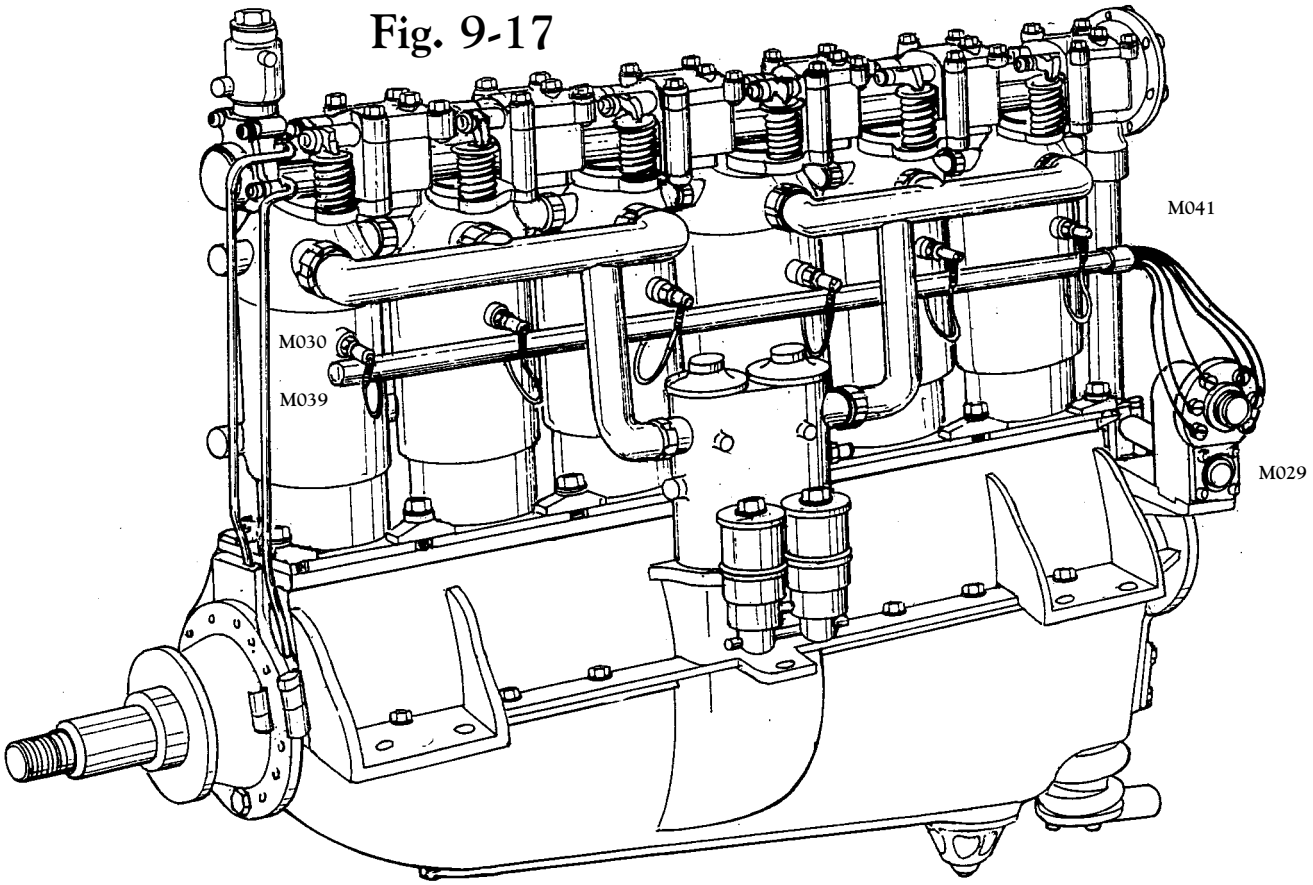


Fig. 9-17



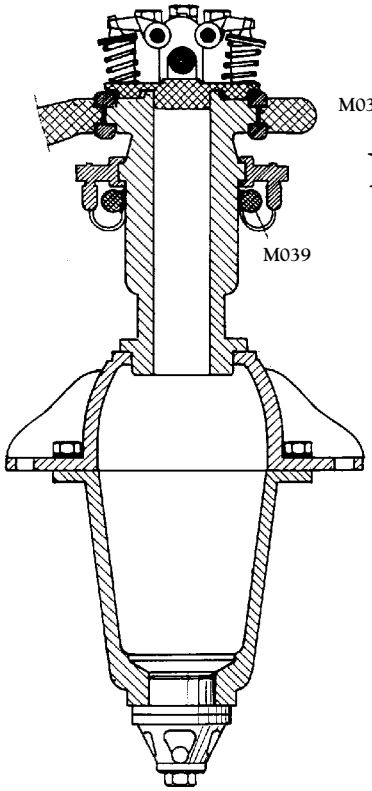
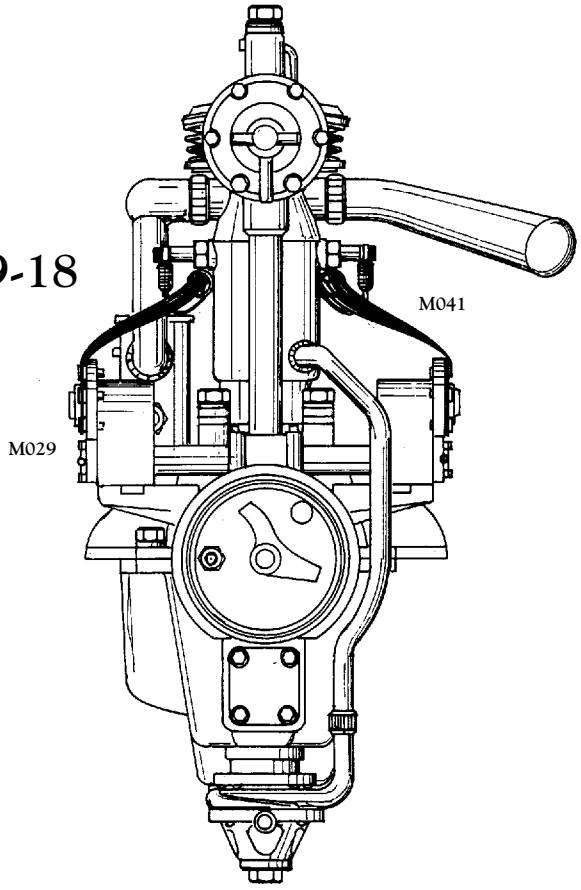


Fig. 9-18



Stage 9 Continued : Assembly of the Mercedes 180 HP Motor and Propeller

Stage 5M Parts List For

Refer to Figure 9-19 and 9-20.

M032	Propeller	Laser cut Basswood parts 5 - Basswood - 1/16" (1.5 mm) thick
M036	Exhaust manifold	1-casting
M042	Sleeves	6-castings (M037)

Exhaust manifold: Using the sleeves (M042), glue the exhaust manifold (M036) to the cylinders as shown in Figure 9-19 and 9-20.

Propeller: The propeller (M032) should be finished, but wait and install it after the aircraft is completely assembled. Glue the 5 laser cut Basswood parts together. Shape the prop according to plan D001. Sand smooth and paint with a clear varnish or a stain such as maple.

Fig. 9-20

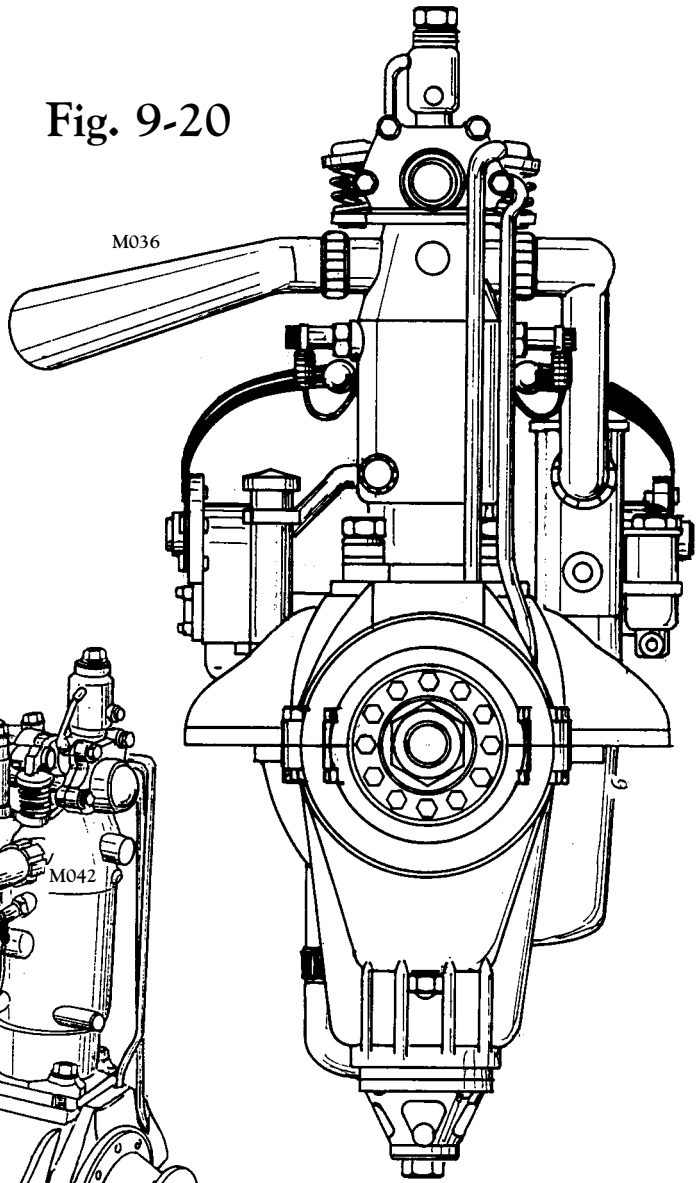
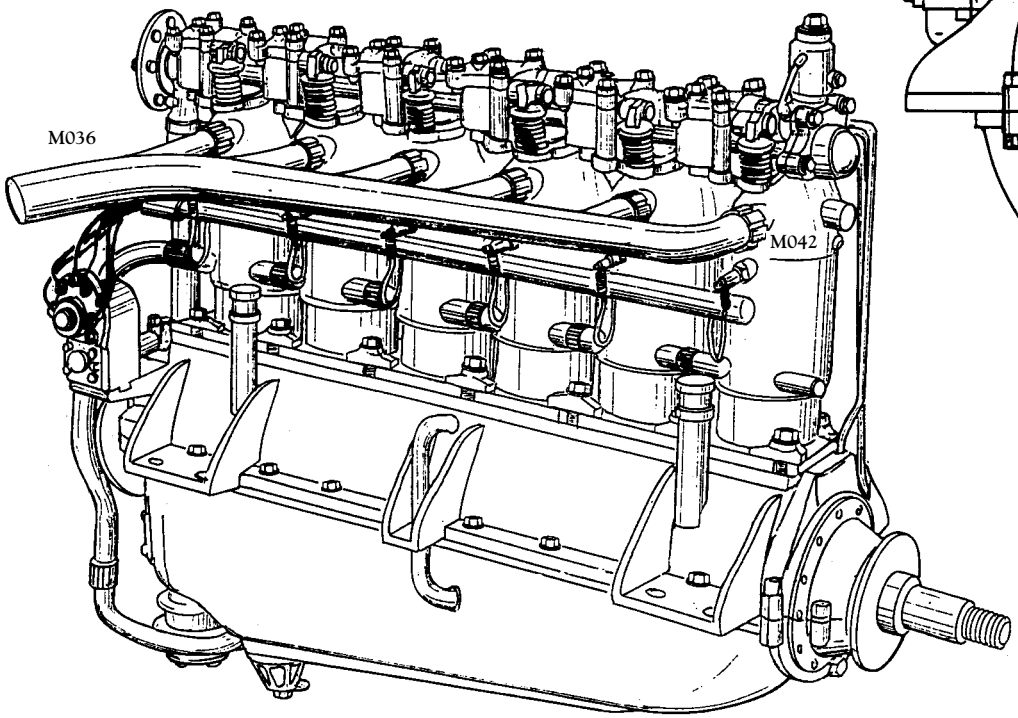


Fig. 9-19



Stage 10 : Installing the Motor and Guns

Refer to Figure 10-1, 10-2, 10-3 and Plan D001

The motor can now be installed onto the motor mount ledges in the fuselage as shown on plan. After installation, there are connections to be made between the motor and fuel tank, and cockpit controls.

Parts List For Stage 10

A016	False nuts	10-castings
A017	False screws	10-castings
A038	Tube	0.025" (0.64)" dia. copper wire
A039	Tube	0.025" (0.64)" dia. copper wire
A040	Tube	0.025" (0.64)" dia. copper wire
A041	Tube	0.025" (0.64)" dia. copper wire
A042	Flex wire	0.025" (0.64)" dia. steel wire
A043	Flex wire	0.025" (0.64)" dia. steel wire
A044	Tube	0.025" (0.64)" dia. copper wire
A045	Tube	0.025" (0.64)" dia. copper wire
A046	Flex wire	0.025" (0.64)" dia. steel wire
A047	Flex wire	0.025" (0.64)" dia. steel wire
C013	Gun unloading channels	2-castings

Mounting the motor: Set the completed motor on the engine ledges (A030) and locate according to the plan. Drill holes thru the ledges using the mounting holes on the motor as a guide. First mark the holes in pencil. Remove the motor and drill the holes. Glue the motor in place and insert false nuts and screws (A016 and A017) in the holes. See Figure 10-1.

Motor tubes and flex wires: There are a number of tubes and flexible wires from the motor to other equipment and the cockpit. Copper wire is used for the tubes and black steel wire is used for the flexible cables. Figure 10-1, 10-2, and 10-3 show the locations of the wires and tubes. Glue with epoxy. The following connections need to be made:

1. Tube from valve C026b to carburetor. (Figure 10-1)
2. Tube from valve C026b to tap C007. (Figure 10-1)
3. Tube from valve C026c to hole left side of tank C003. (Figure 10-1)
4. Tube from valve C026c to hole below tank C003. (Figure 10-1)
5. Flex wire from spark control handle C056 to magneto M029. (Figure 10-1)
6. Flex wire from aux throttle handle C057 to carburetor M012. (Figure 10-2)
7. Tube from oil tank to oil pump M020. (Figure 10-2)
8. Tube from greaser C062 to box M023. (Figure 10-3)
9. Flex wire from throttle C037 to the carburetor M011. (Figure 10-3)
10. Flex wire from button on hand grip C036 to M024. (Figure 10-3)

Mounting the machine guns: Refer to Plan D001 for guns location. Mount on brackets C019 and C021. Next, glue on the cartridge unloading channels (C013).

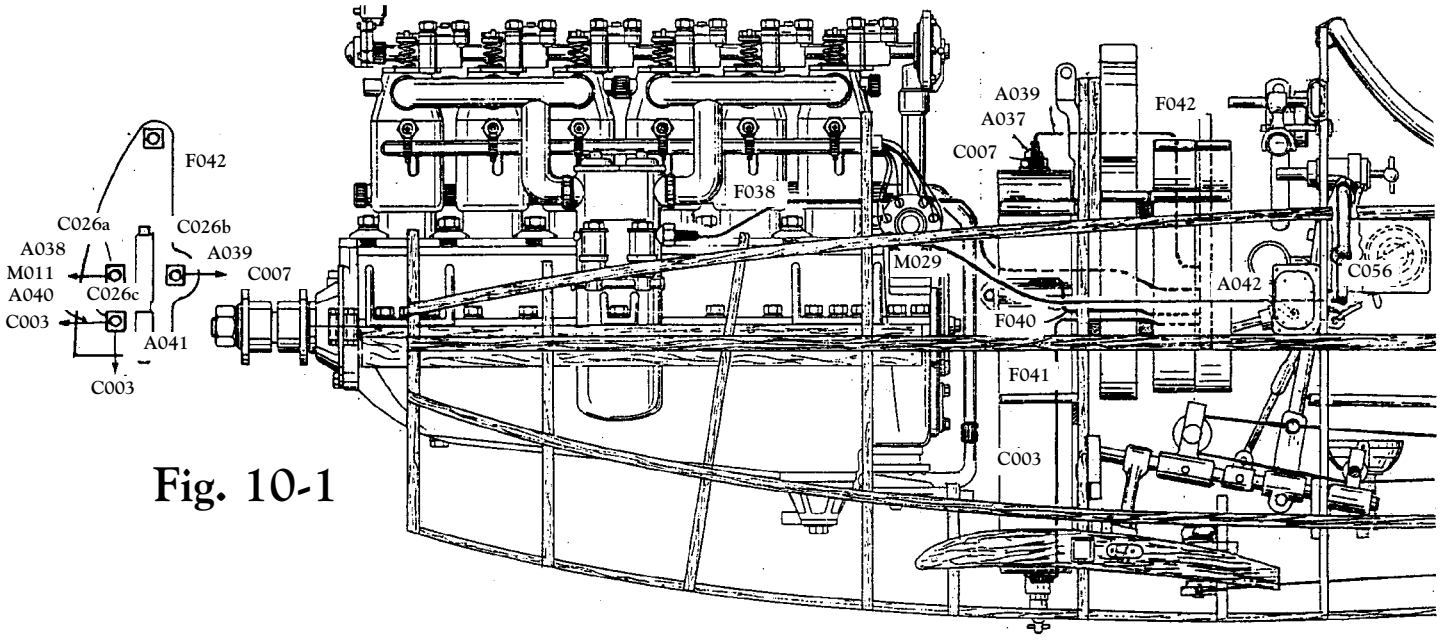


Fig. 10-1

Fig. 10-2

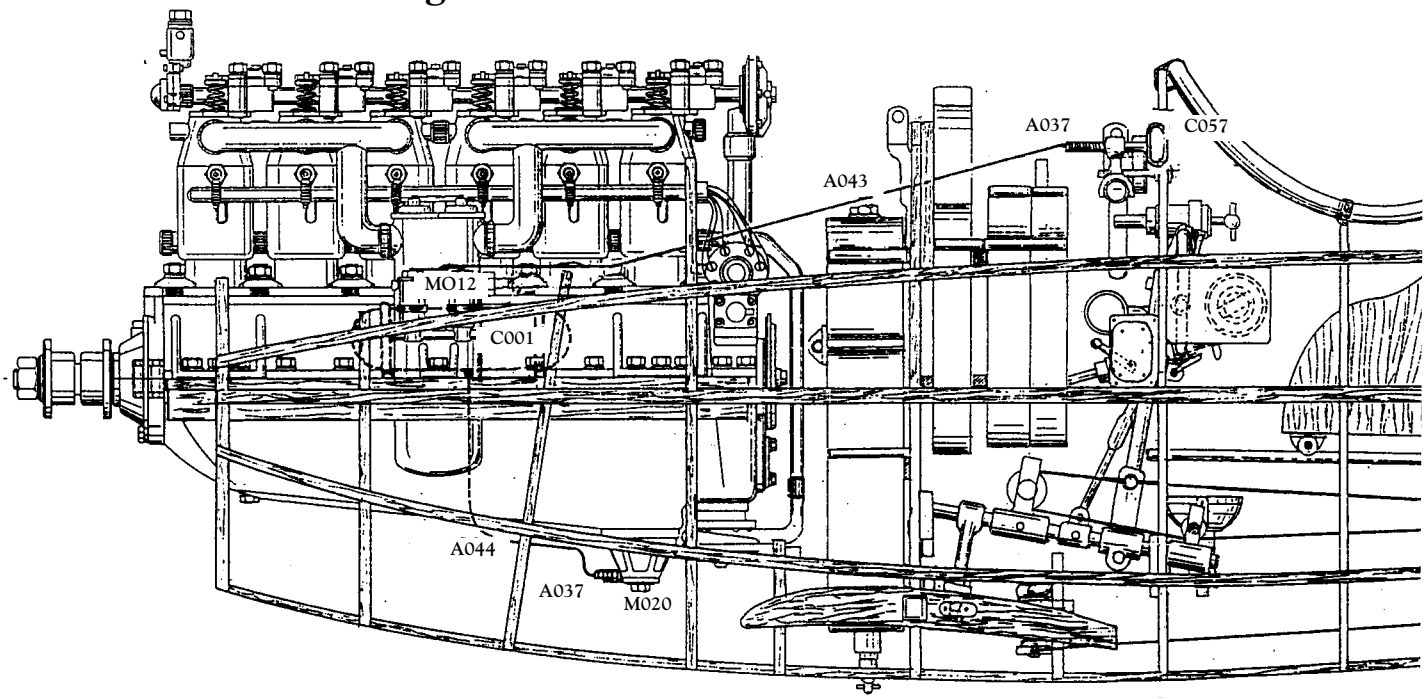
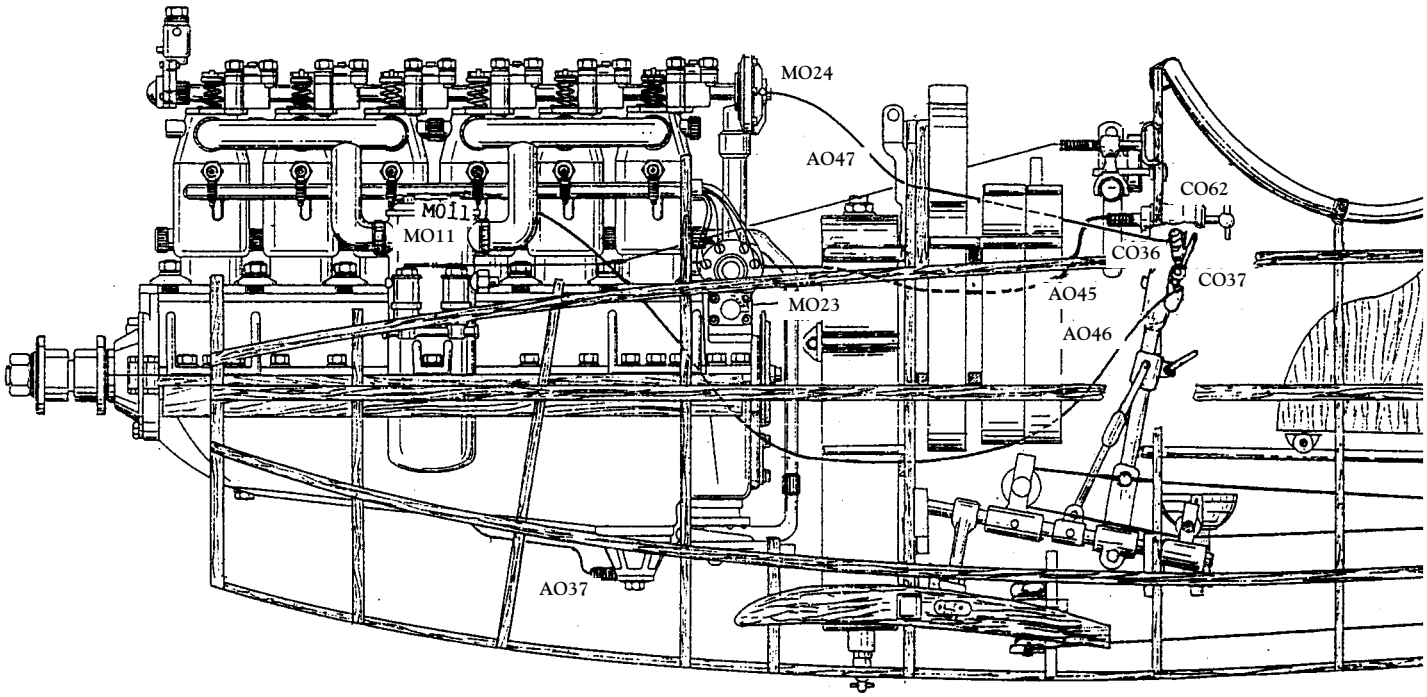


Fig. 10-3



Stage 11 : Installing the Radiator and Air Speed Indicator

Refer to Figure 11-1, 11-2, 11-3, and Plan D001.

Parts List for Stage 11

R00	Radiator	1 kit (3 castings)
R01	Connection	1- casting
R02	False tube	3/32" aluminum tubing
R03	Connection	1-casting (M027)
R04	False tube	3/32" aluminum tubing
R05	Support	1-casting
R06	Handle	1-casting (C056)
R07	Sleeve	6-castings (M013)
A048	Air speed indicator	1-casting

Radiator assembly: The radiator has three parts shown assembled in Figure 11-1. The top half, lower half with adjustable shutters, and the expansion reservoir on top. Glue together.

Radiator installation: Plan D001 shows the location of the radiator in the upper wing. Before gluing the radiator in place, install the sleeves (R07) and the curved connection parts (R01 and R03) on the motor. Also install the sleeves on the radiator. Then glue the radiator in place. The false tubes R02 and R04 (a 2.5 mm dia. britannia rod) connect between the motor and radiator. However, you cannot install these until the upper wing is on the model. Refer to Stage 12.

Radiator shutter handle: Install the support (R05) and the handle (R06). Glue this to the wing trailing edge directly in back of the radiator centerline. See Plan D001 (view looking at the front of the aircraft). Use a piece of thread or wire between the handle and adjustable shutters on the radiator as shown in Figure 11-2.

Air speed indicator: Install the air speed indicator (A048) on the right wing strut as shown on plan D001.

Fig. 11-1

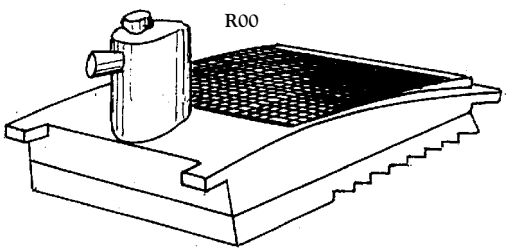


Fig. 11-2

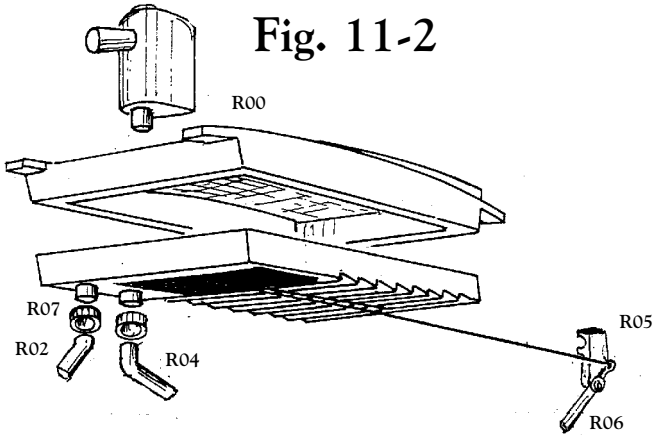


Fig. 11-3

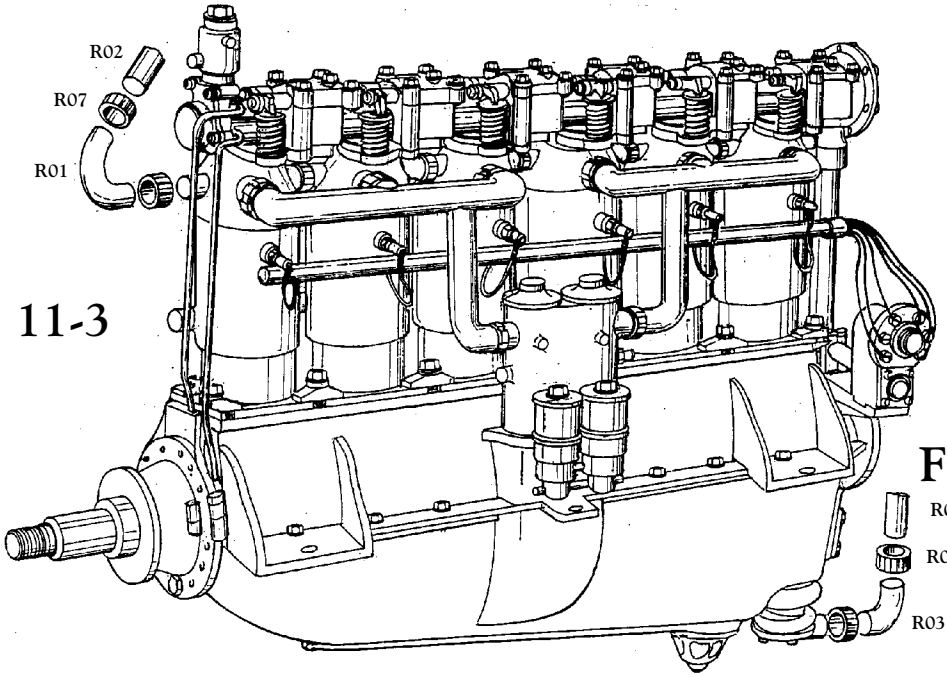


Fig. 84

Stage 12 : Assembly of Wings to Fuselage, and Control and Guy Rigging

Refer to Figure 12-1 to 12-12 and D004

Parts List For Stage 12

A015	"V" strut flanges	2-castings
A016	False nuts	14-castings
A017	False screws	14-castings
A018	"N" wing struts	2-castings
A019	"V" wing struts	4-castings
A020/22	Wing cross bracing	0.25 mm (0.010”) dia gray nylon cord
A021,23,26, 28-32	Turnbuckles	16-castings (W042)
A024,25,27	Bracing	0.25 mm (0.010”) dia gray nylon cord
A033-36	Aileron control cables	0.25 mm (0.010”) dia gray nylon cord

General: With the motor and guns installed in the fuselage and the radiator installed in the upper wing, you can now proceed with the final assembly and rigging. Suggest installing aileron control cables before the wing. Leave enough extra line to complete the rigging.

Installing the lower wings: Remove the fuselage from the building stands and set on a level surface. First, glue the "V" strut flanges (A015) along with the false screws and nuts (A016/17) to the lower wings as shown in Figure 12-1. These attach to the attachment struts (W088) already on the lower wings.

Install the wings against the center section ribs on the fuselage (Figure 12-2). Block up the wings to the dihedral angle and angle of attack as shown in Figure 12-3. When all is correct, glue the wings to the fuselage ribs, then tie the wings down to the blocks at the end. You should also tie down the wheels so the entire assembly will not move and remains at the correct angles.

Installing the upper wing: With the upper wing upside down, connect the "N"struts (A018) to the inboard attachment fittings on the wing (W041). Don't glue yet; you will need to do some alignment. The bottom of the struts, in order to mate with the fuselage, are spaced as shown in Figure 12-4. You can temporarily add a wooden strip between the struts to hold the alignment until ready to install on the fuselage.

Shape per Figure 12-6 and attach the "V" struts (A019) and the false nut and screws to the outboard fittings W041.The wing is now ready to install. Fit the "N" struts on the fuselage as shown in Figure 12-5. When aligned, epoxy in place. Next, block up the ends of the wings to the correct spacing between upper and lower wing. Use a balsa or basswood block or sheet as a spacer. The upper wing is flat (has no dihedral). When all is level and spaced correctly, epoxy the lower ends of the "V" struts to the Attachment flanges (A015) on the lower wing (see Figure 12-6).

Connecting pipes between radiator and motor: The false tubes R02 and R04 (a 2.5 mm dia. britannia rod) connect between the motor and radiator. Fit these according to the plan and Figure 11-2 and 11-3. After pre-fitting, glue in place.

Wing rigging: The wing wire bracing (cord for model) is illustrated in Figures 12-7,12-8,12-9 and 12-10. One end of each brace line is fitted with a turnbuckle and secured as illustrated. The other end is seized to a fitting. Make sure all lines are tight without any slack. Secure the turnbuckle end first, then secure the other end. Do the rigging between the struts first, then the outboard rigging, then the lines to the front of the fuselage.

Aileron control cable: Figure 12-11 illustrates the run of the aileron rigging. The lines pass around pulleys in the cockpit and secure to turnbuckles secured to the ailerons (W047/48) as shown in Figure 12-12.

Fig. 12-1

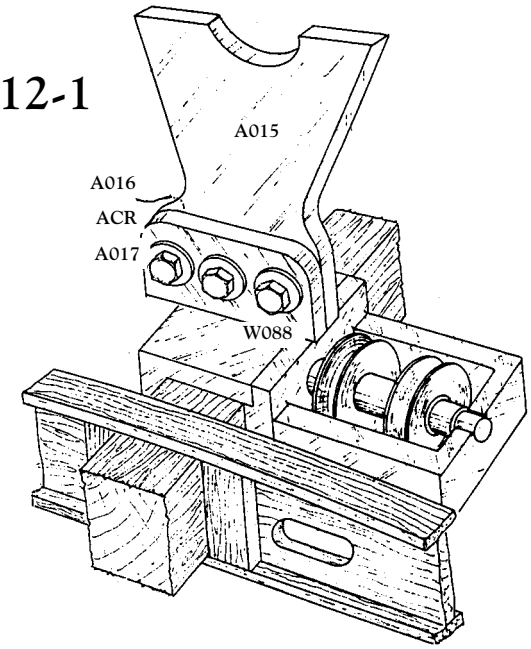


Fig. 12-2

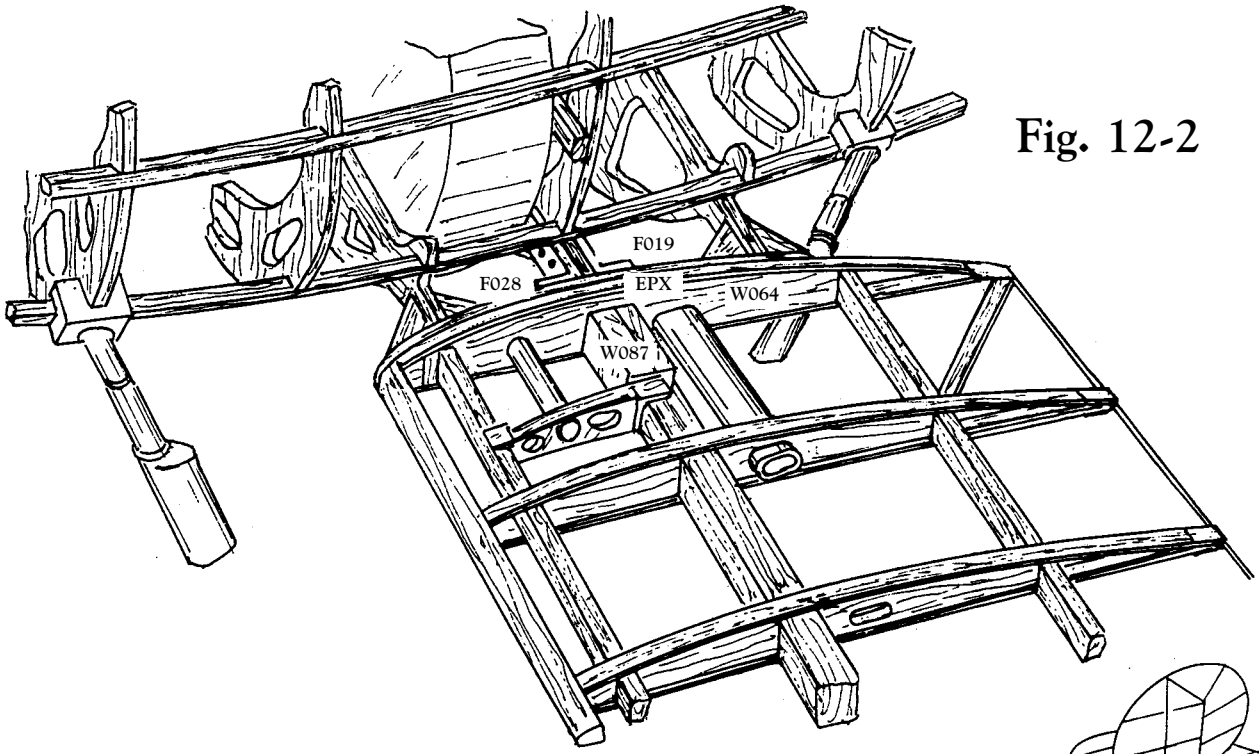


Fig. 12-3

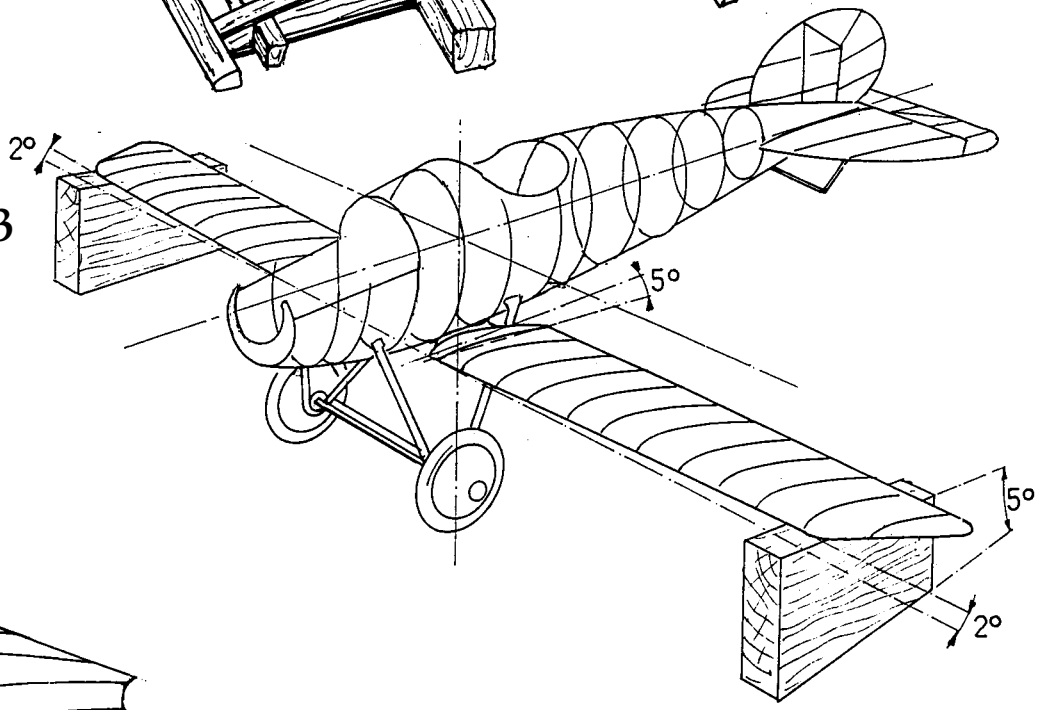


Fig. 12-4

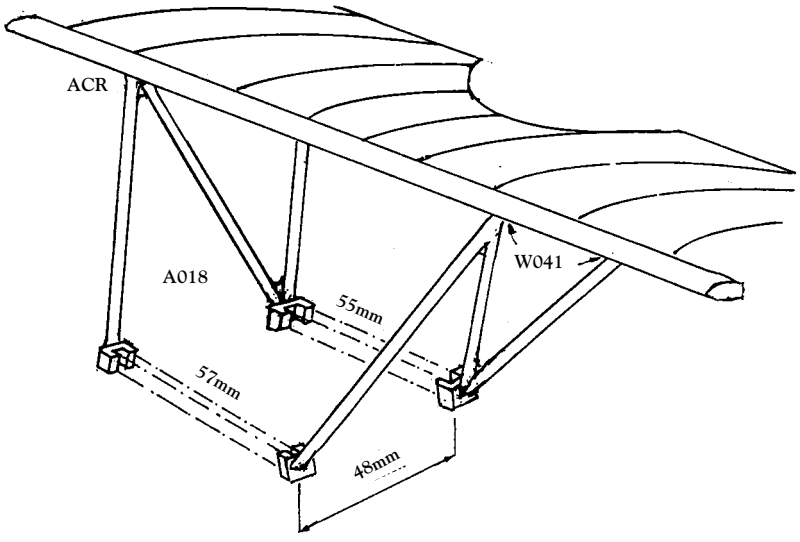


Fig. 12-5

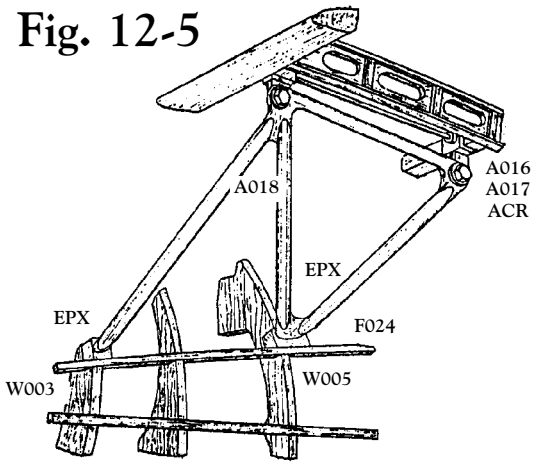


Fig. 12-6

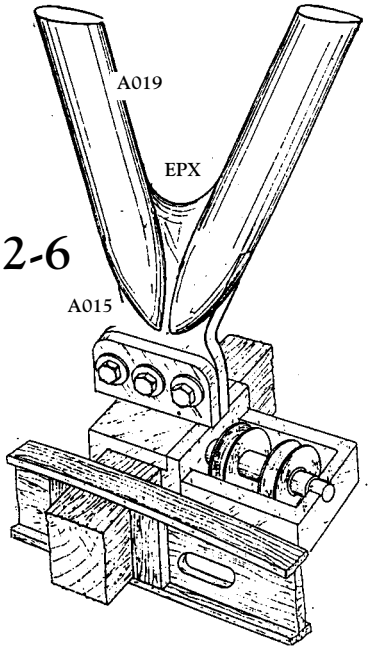


Fig. 12-7

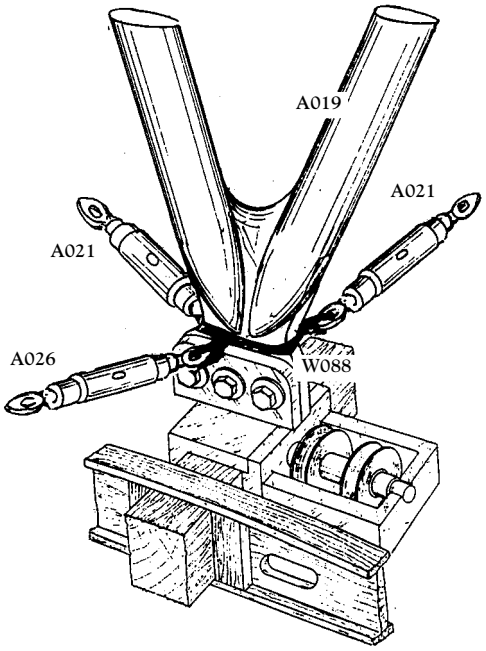


Fig. 12-8

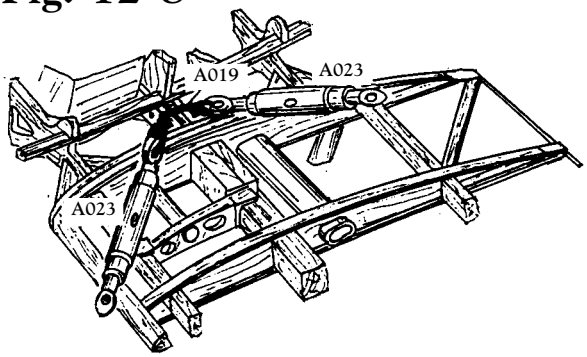


Fig. 12-9

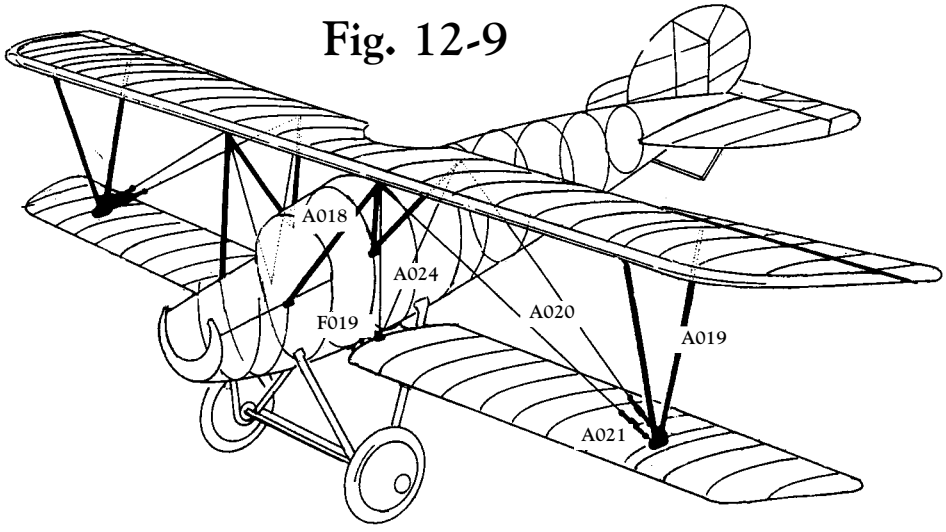
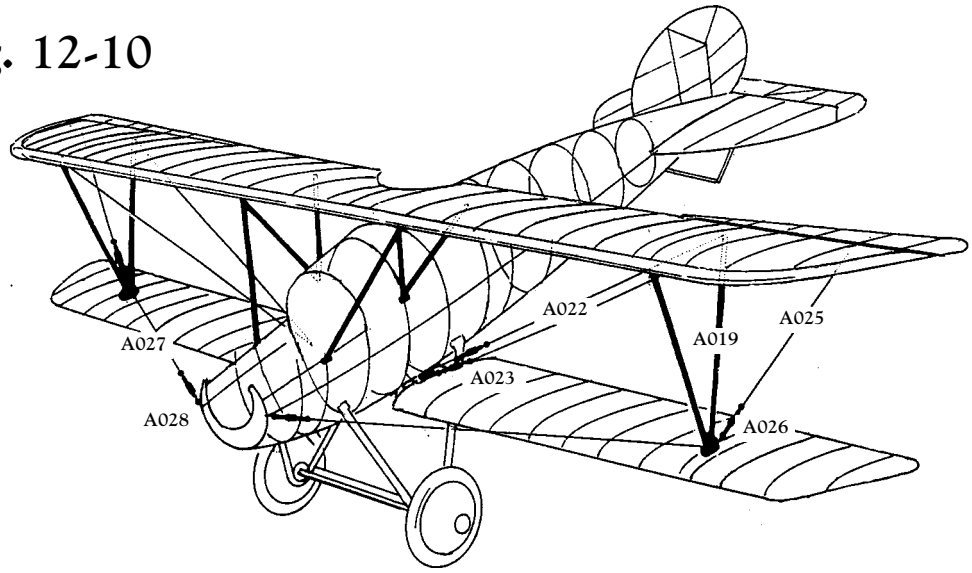


Fig. 12-10



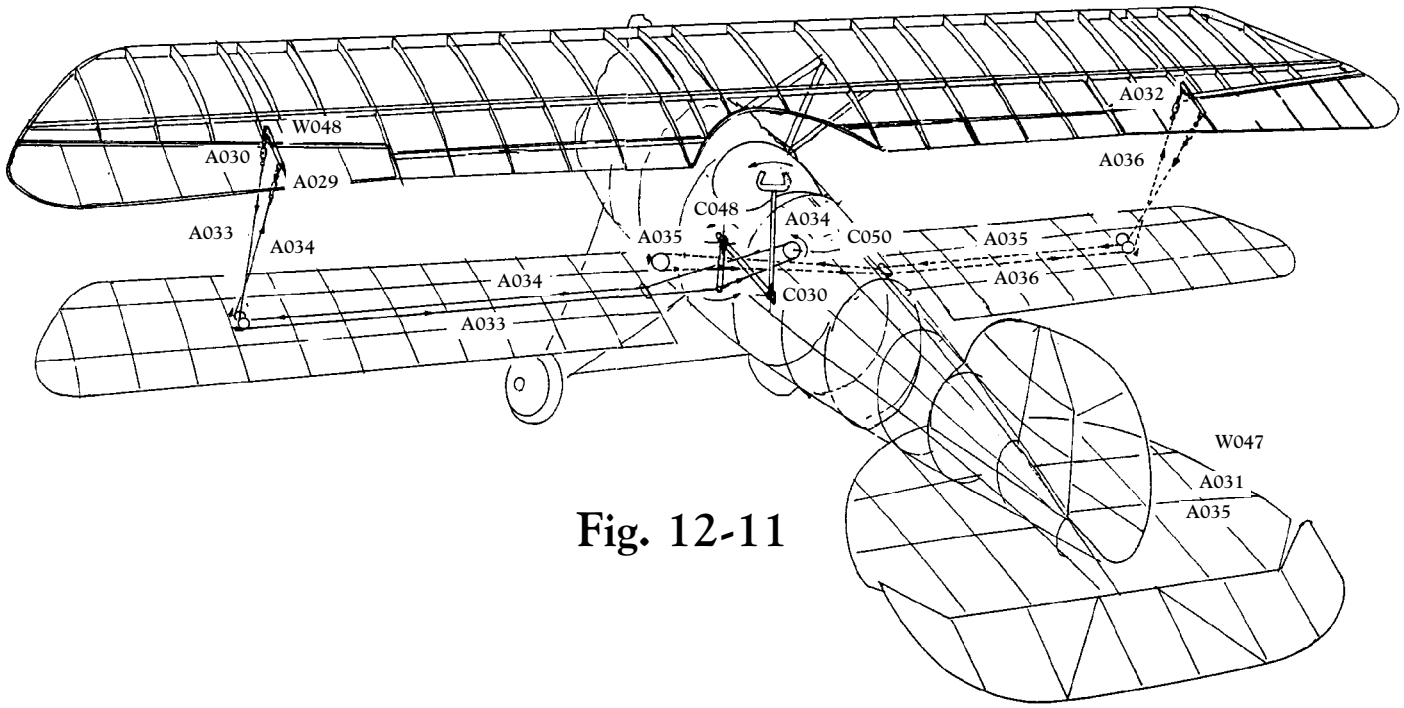


Fig. 12-11

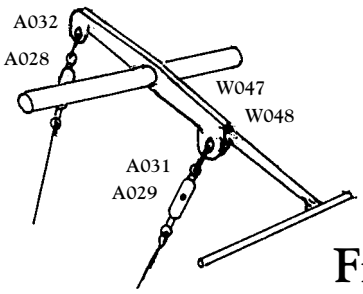
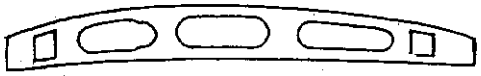


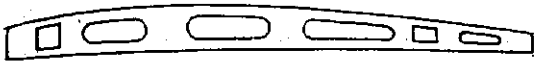
Fig. 12-12

APPENDIX A - LASER CUT WOOD PATTERNS

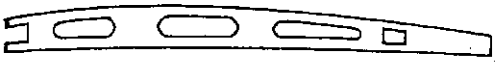
W002 to W007 W015 to W021



W001 to W014

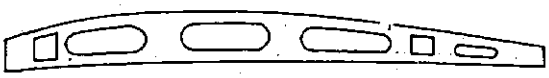


W011 to W025

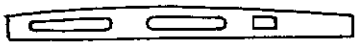


W012 to W026

W008 to W022

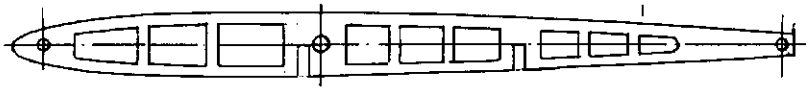


W009, W010, W023, W024

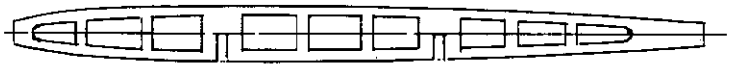


W013 to W027

Upper Wing Ribs



F044 (2 Required)



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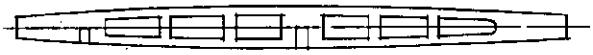
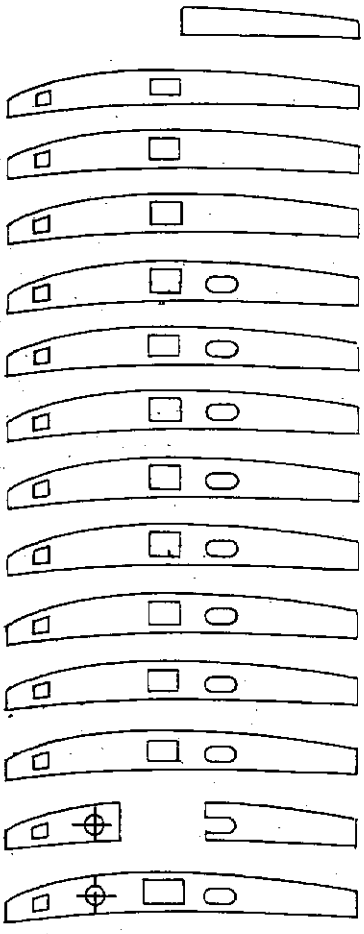


F046 (2 Required)

F047 (2 Required)

F048 (2 Required)

Lower Wing Ribs Ribs



W063 W076

W062 W075

W061 W074

W060 W073

W059 W072

W058 W071

W057 W070

W056 W069

W055 W068

W054 W067

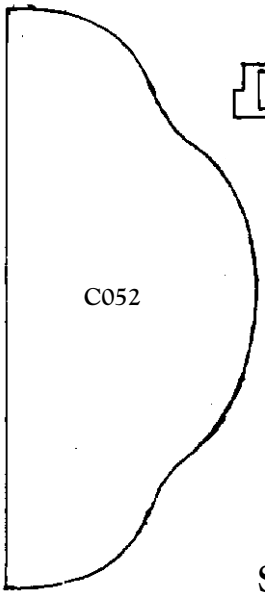
W053 W066

W052 W065

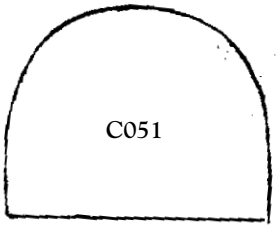
W051b W064b

W051 W064

Stabilizer Ribs



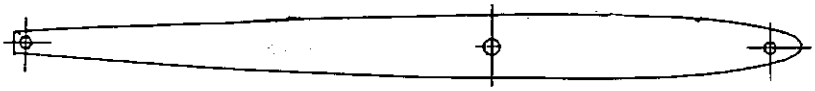
C052



C051

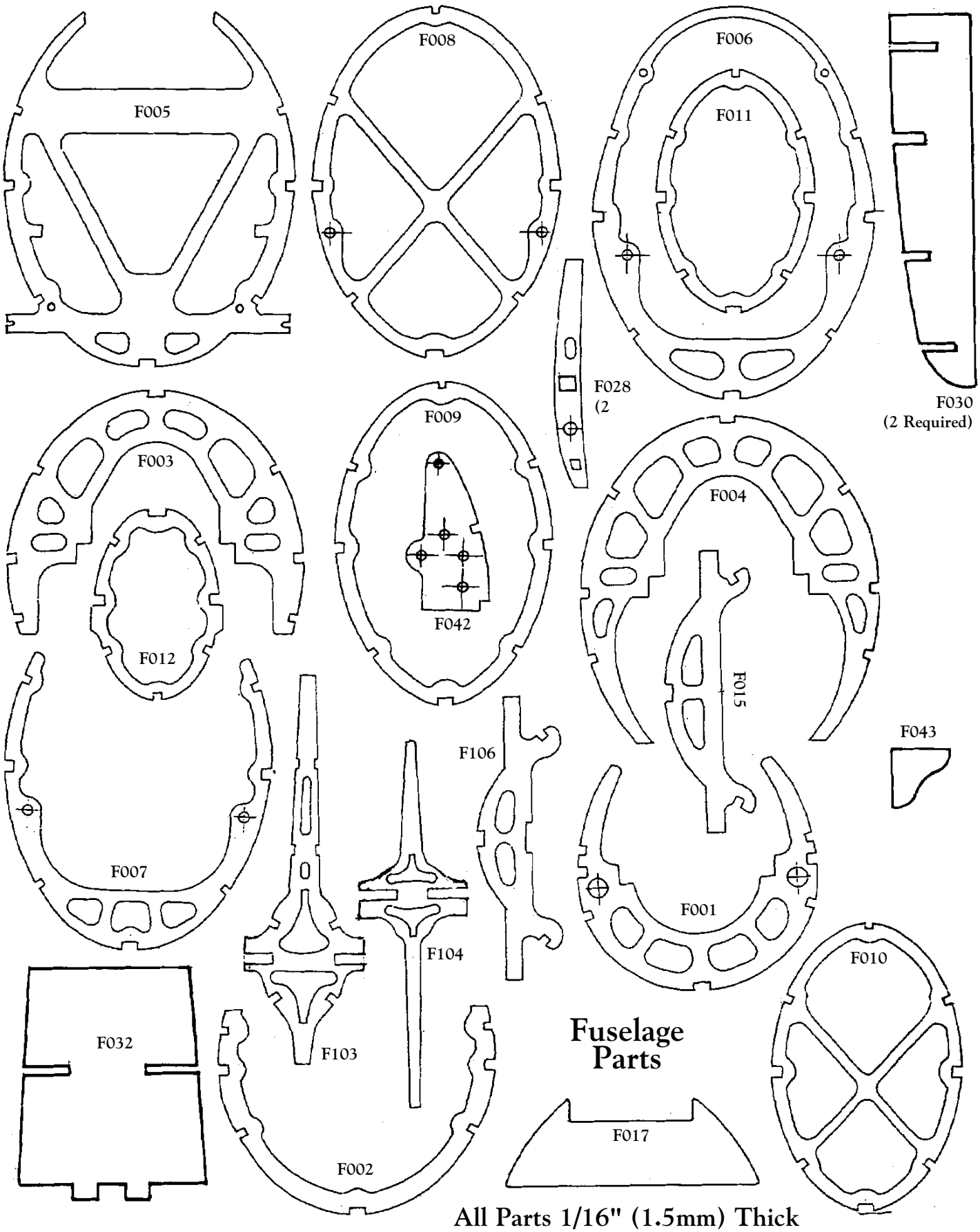
Seat

Stabilizer - Root Rib



F037 (2 Required)

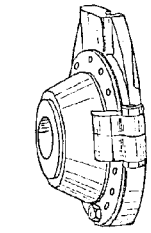
3/64" (1mm) Thick

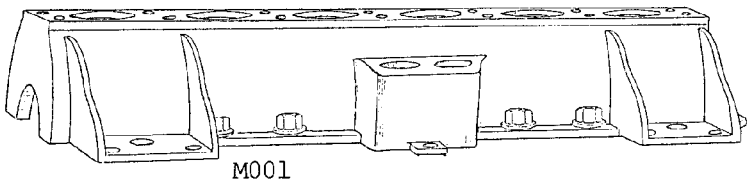


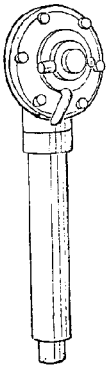
Fuselage Parts

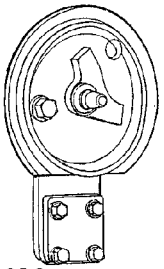
All Parts 1/16" (1.5mm) Thick

APPENDIX B - METAL CASTINGS


M004


M001


M024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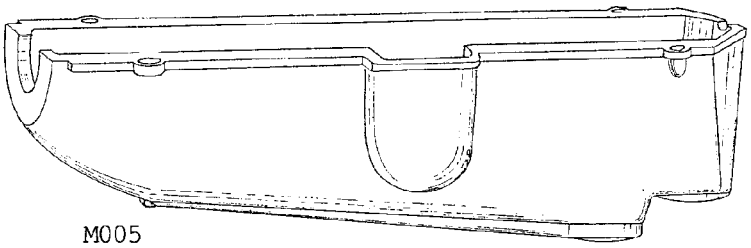
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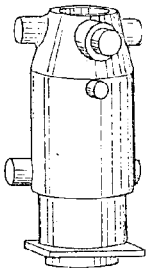
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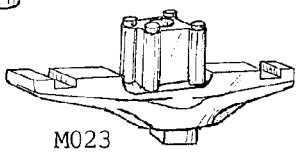
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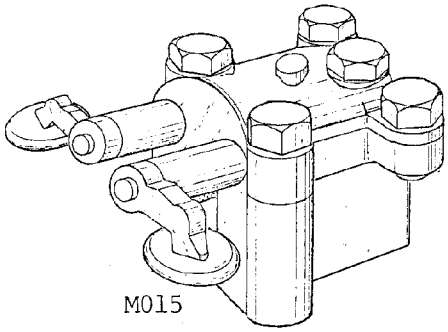
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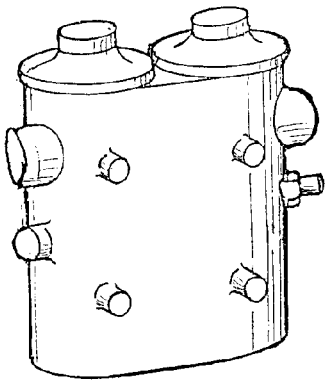
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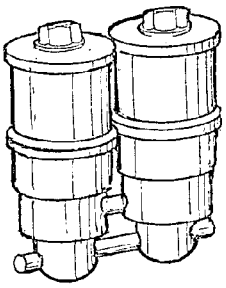
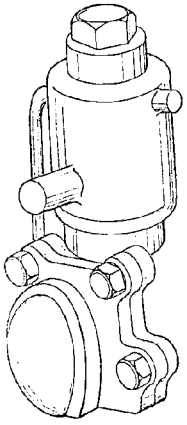

M012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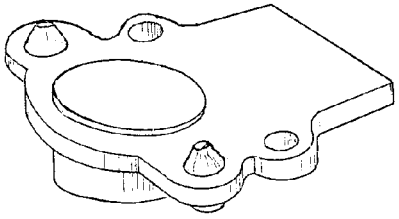
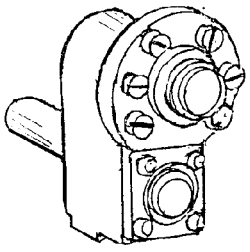

M014


M034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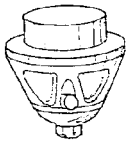
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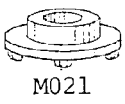
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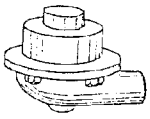
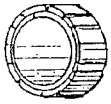

M022


M026


M025


M035


M009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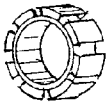
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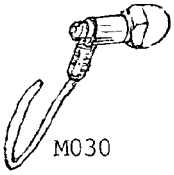
M007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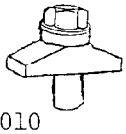
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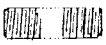
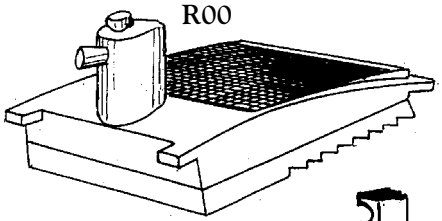
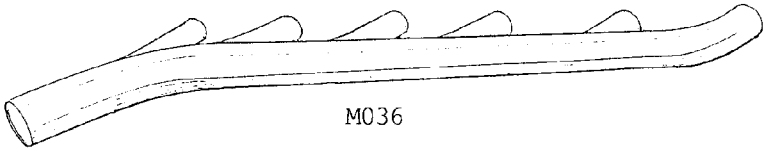

M002


M003

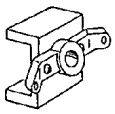

R00

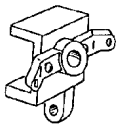

M036


M040


R05

APPENDIX B - METAL CASTINGS


W040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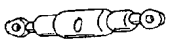
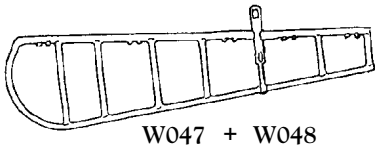

W042


W047 + W048

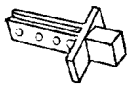

W086

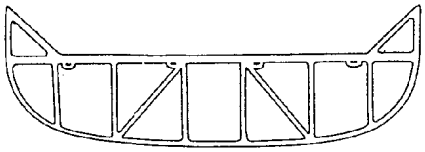

W088


W089


W092


W095


F019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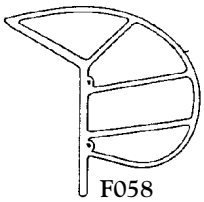
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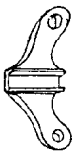
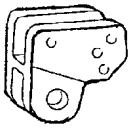
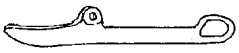
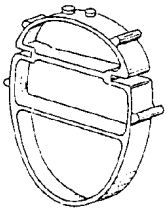

F055


F059


F062


F063


C002

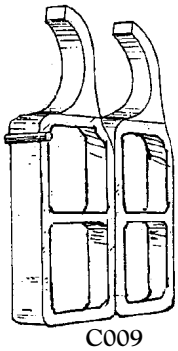

C003

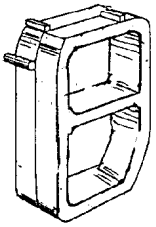

C005


C008


C006


C007


C009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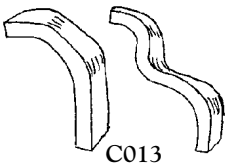
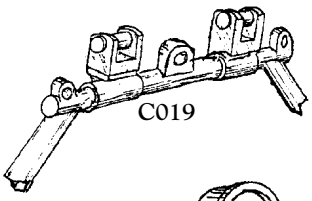
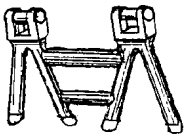

C013

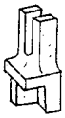
C018


C017


C016 C015


C019


C021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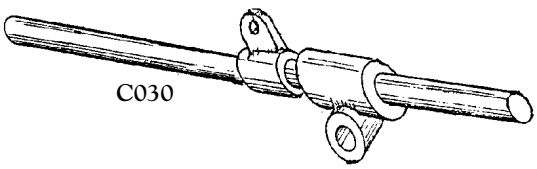
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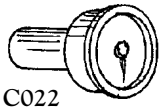
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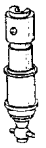
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C023


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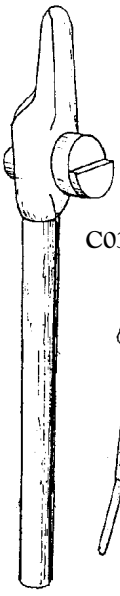
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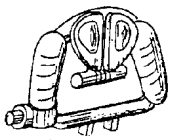

C036


C037


C048

C031

C033

C032

C025

C026

C034

C061

C038

C054

C056

C058

C059

C044

C050

C042

C040

C039

C046

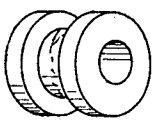
C055

C057

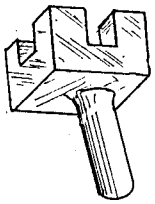
C060

C062

APPENDIX B - METAL CASTINGS



A002
2 + 2



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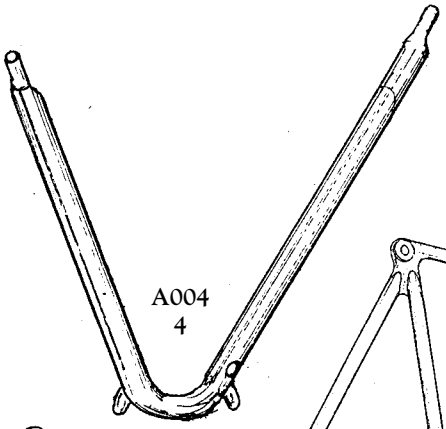
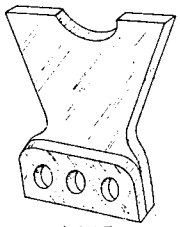


A004
4

A016
42

A017
17



A015
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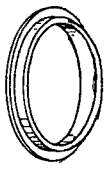

A012
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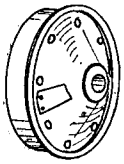
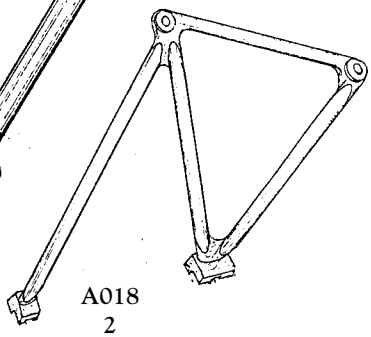


A011
2

A014
2



A018
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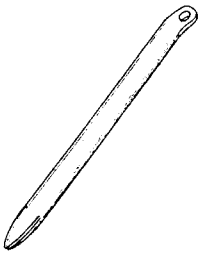

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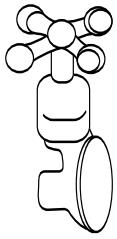
2



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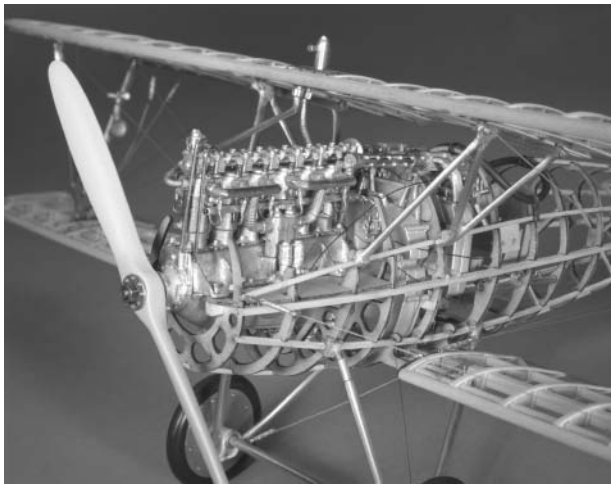

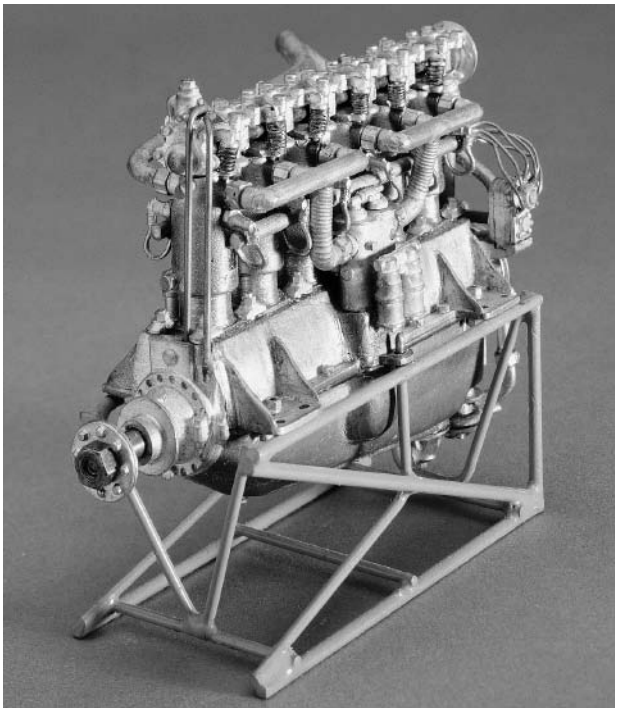

Finishing Touches

Check the entire model over, and touch up any remaining stain or paint. Check all rigging lines to make sure they are tight. Stand back and take a picture.

Congratulations - the ALBATROS is finished! Take a moment to revel in your accomplishment. You've persevered when the going became rough and your effort has produced results. You've developed skills you never knew you had, increased your vocabulary, and become a time traveler. We hope you've enjoyed your voyage and look forward to flying with you on your next aircraft modeling project.

As this is a delicate model, it is suggested that it be mounted on a suitable baseboard and housed in a protective glass or plastic display case.

MODELER'S LOG

DATE	TIME	NOTES

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