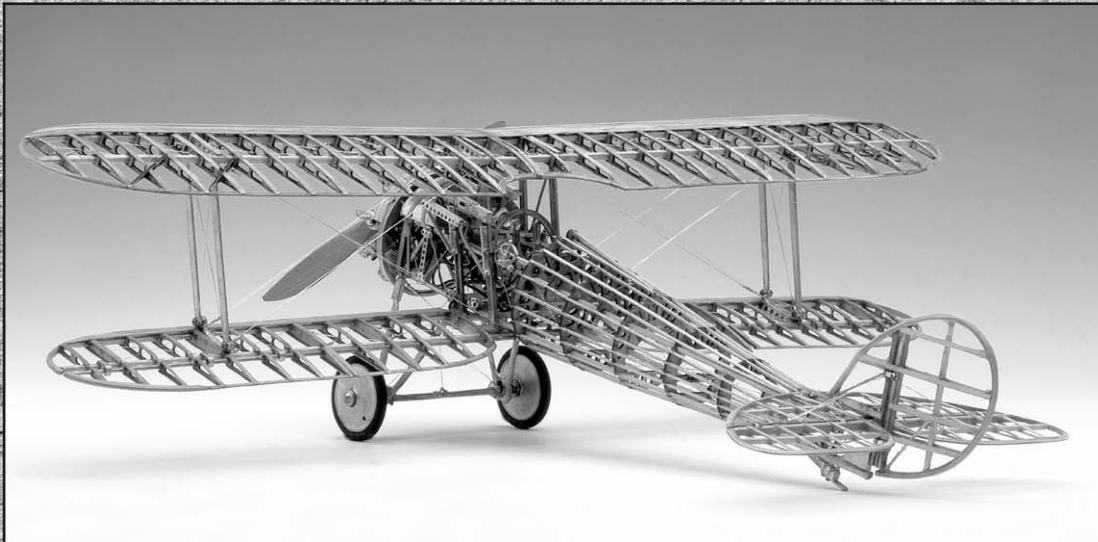


# NIEUPORT 28



**WORLD WAR I  
FRENCH FIGHTER AIRCRAFT - 1917**

**1:16 SCALE**  
**Wingspan: 508 mm (20")**  
**Fuselage: 400 mm (15-3/4")**  
**No. MA1050**

**MODEL AIRWAYS**



# INSTRUCTION MANUAL

WORLD WAR I FRENCH FIGHTER AIRCRAFT - 1917

## NIEUPOINT 28

INSTRUCTION MANUAL PREPARED BY KENNETH H. GOLDMAN

SCALE: 3/4" = 1'0" (1:16) • Kit No. MA1050

Wingspan: 508 mm (20 inches)

Fuselage Length: 400 mm (15-3/4 inches)

### HISTORY

The French-built NIEUPOINT 28 biplane was manufactured by the Nieuport company - Société des Etablissements Nieuport, founded by Edouard de Niéport at Issy-les-Moulineaux in 1910. Many designs were developed including the first Type 10, then Type 12,17, 24 and 27. The Type 28 was the most streamlined plane and the last of the Nieuport family of single-seater aircraft. First flown in prototype form in June 1917, it was a completely new design, albeit based on experience gained with the earlier Type 27. Although French-built, the NIEUPOINT 28 served in the air services of all the Allied nations and on all fronts. It was the first fighter aircraft flown in combat by the 27th, 94th, 95th, and 147th Squadrons of the United States Air Service (American Expeditionary Forces). 297 aircraft were received by the squadrons. On April 14, 1918, the aircraft's second armed mission, Lieutenants Alan Winslow, and Douglas Campbell (the first American-trained ace) of the 94th Aero Squadron both shot down an enemy aircraft. The NIEUPOINT 28 was flown by many American aces, among them the "Ace of Aces" Captain Eddie Rickenbacker, with 26 victories. It was a favorite because of its speed and maneuverability.

The NIEUPOINT 28 has a wingspan of 26 feet 9 inches and has a maximum weight of 1625 pounds (1172 pounds empty weight). It flies at a speed of 122 mph, has a range of 248 miles, endurance of 1-1/2 hours, and the service ceiling is 17,000 feet. The aircraft is a single-seater and is powered by a 160 HP Gnome-Rhône Monosoupape 9N, 9 cylinder, air cooled rotary engine. The plane has no throttle and once started, the Gnome rotary engine runs on full all the time. The pilot controlled the plane's speed by turning off and on individual or groups of cylinders. There is no oil pan to re-circulate the castor oil lubrication. After circulating through the engine, the oil simply sprayed out into the air. One can only imagine the effects on pilots after inhaling a mist of pure castor oil for an hour! Armament consists of two Vickers 0.30 caliber synchronized machine guns.

A number of NIEUPOINT 28's have been restored and can be found in aircraft museums. The Smithsonian Institution's Garber Preservation Facility in Suitland, Maryland outside Washington, DC, has recently restored (summer 2000) a NIEUPOINT 28 C-1 for display in the National Air and Space Museum.

### INDEX

# WORLD WAR I FRENCH FIGHTER AIRCRAFT

## NIEUPORT 28 - 1917

The NIEUPORT 28 model plans and kit were completed in 2000. The model was designed for Model Airways by Microfusioni - modellismo of Milan, Italy, owned by Luigi Volonté and son Bruno. The designer, Luigi Volonté, a former World War II fighter pilot, also designed the 1:16 scale German fighter Albatros D.Va, the first aircraft kit manufactured by Model Airways. Model plans and original Instructions in Italian were developed by Luigi Volonté. The text was rewritten in English and expanded by Kenneth H. Goldman. The model was built by the designer, Luigi Volonté.

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### Before You Begin

The NIEUPORT 28 kit is intended as a structural, non-flying, model without any fabric covering. It is about as close as you can come to being able to hold the real thing in your hand. Most every detail of the real aircraft has been included as model scale permits. Britannia castings and laser-cut wood fittings eliminate creating many parts from scratch, however, some final finishing is required before they are suitable for the model.

Before starting the model, carefully examine the kit and study the plans. Every effort has been made to present the construction stages in a clear, logical sequence. Nevertheless, it is recommended that you think several steps ahead and check the plans accordingly during assembly. This will help clarify what you are doing now and will ensure proper fit of the sub-assemblies later. The instructions will help, but a thorough knowledge of the plans at the outset is essential.

Determine if all the listed parts are present. Handling them will produce a better understanding of the kit's requirements and will help you visualize how every piece will look on the completed model. To avoid losing small fittings and hardware, sort them into labeled containers with lids to keep the parts in and dirt out.

Although each Stage in the instructions results in a completed sub-assembly, it is recommended that you begin at Stage 1 and proceed in order to the finish. Certain modeling techniques are described in full when they first appear in the sequence and only are referred to in subsequent steps. Always complete one construction stage before moving to the next. If things go awry, take a break, then consider doing them over.

## Plans

The Model Airways' NIEUPORT 28 kit is manufactured to a scale of 1:16 or 3/4" equal to one foot. In addition to the Figures that appear throughout this instruction manual, three full-size plan sheets (D01, D02, D03) are provided. Each plan sheet is drawn to the actual size of the model except for some areas that have been enlarged to better show detail. Note that full-size Plan D04 (the propeller) is included in this instruction booklet.

Dimensions can be lifted directly off the full-size plans by using draftsman dividers, a strip of paper laid on the plans on which you make at dot indicating each end of a part, or simply by laying wood strips directly on the plans and marking where to cut them.

The following table gives inch equivalents and compares full-size dimensions with scale model inches and millimeters:

Full-Size Inches	Scale Inches	Scale Millimeters
1/4"	1/64"	0.40mm
1/2"	1/32"	0.79mm
3/4"	3/64"	1.19mm
1"	1/16"	1.59mm
1-1/4"	5/64"	1.98mm
1-1/2"	3/32"	2.38mm
1-3/4"	7/64"	2.78mm
2"	1/8"	3.17mm
2-1/4"	9/64"	3.57mm
2-1/2"	5/32"	3.97mm
2-3/4"	11/64"	4.37mm
3"	3/16"	4.76mm
6"	3/8"	9.53mm
9"	9/16"	14.29mm
12"	3/4"	19.05mm

## Parts

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 that lists 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. These are identified both by size and by the names of the aircraft parts that will be made from them. This material must be cut to length or shape according to plan dimensions.

## Kit Lumber

Wood strips and sheets of solid basswood or birch plywood are supplied in the kit. Generally, these parts will be referred to by their size as well as their general part number. Sort and label the wood in the kit by dimensions to save time. After selecting and cutting what you need, return the remaining stock to the proper thickness and wood type pile. For best results, cut wood strip lengths a little long and then sand the ends to achieve the exact length and fit. Even though Model Airways supplies enough extra wood to complete the model before running out, it is recommended that you plan to measure and cut the required parts so as to minimize waste. That way you are covered if you make a mistake.

## Cast-Metal Fittings

These parts will require final finishing before mounting on the model. Remove mold joint flash with a #10 or a #11 hobby blade, then file or sand with fine sandpaper. Some of the holes through which other parts fit, such as the small eyes of a turnbuckle, may have filled in during the casting process. Carefully clean these out using a drill bit or reamer and check the fit of the other parts. To ensure good glue and paint bonds to these parts, wash off the remaining traces of the mold release agent. A spray of ammonia window cleaner and gentle brushing with an old soft-bristle toothbrush does the job nicely. Thoroughly rinse the parts and allow them to dry.

## Rigging Line

On the real aircraft the rigging is 1/8" or 5/32" diameter stranded steel wire. For the kit, however, metal-gray thread in a single diameter is provided to make it easier to rig. To reduce or eliminate slackening of the rigging line due to weather changes after you have finished your model, pre-stretch the line by dampening it and hanging it with a weight on one end to dry. I prefer to leave the line hanging and cut what I need, as I need it, always re-attaching the weight.

## Necessary Construction Tools

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 with No. 11 and No. 10 blades
2. Razor saw or jeweler's saw

### B. Files

- Set of needle files
- Flat, fine-tooth, mill bastard file (for fuel tanks)
- Round riffer file

### C. Clamps and Pins

1. Assorted Bulldog clips
2. Wooden clothespins (craft shops carry small versions)
3. Rubber bands
4. Package of push-pins or T-pins

### D. Boring Tools

1. Set of miniature drills (#60 to #80)
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
6. Mechanics rule graduated in 64ths of an inch and millimeters

### F. Sandpaper

- #120 aluminum oxide paper for shaping wood parts
- #200 wet/dry silicon carbide paper for intermediate sanding
- #400 wet/dry silicon carbide paper for fittings and finishing

### G. Glue

White glue or the yellow carpenter's glue for wood parts. Medium viscosity cyanoacrylate (CA) glue (Super Glue) for metal parts, metal to wood, and rapid assembly of wood parts.

### 3. OPTIONAL

Cyanoacrylate De-Bonder (just in case you have to take something apart)  
Cyanoacrylate Accelerator for an instant bond. Five-minute epoxy provides extra strength for gluing fittings.  
Water-thin cyanoacrylate glue to bond fittings by capillary action



## 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. You can use a table, but a portable board is good for turning it around to make the work easier.

## Setting Up The Plans

Build the wings, fin and rudder, stabilizer and elevator directly on Plan D02. Place the plan on your building board and cover the plan with waxed paper or plastic wrap. Be careful applying glue, especially super glue. Although the waxed paper or plastic wrap protects the plan somewhat, you could accidentally glue the protective sheet to the model parts, or even to the plan itself.

An alternative, if you have a dedicated modeling area, is to lay a sheet of glass over the full-size plan sheet and build directly on the glass, using tape and weights to hold the parts in position. If you use this method, watch out for sharp edges on the glass.

## Getting Started

Before commencing each stage of construction, have all the parts for that stage identified and ready to use. It helps to lay each part on its corresponding location on the full-size plan to facilitate identification as you proceed. Lightly sand wood parts as required to remove any fuzziness and prepare the castings parts as noted above.

To achieve maximum accuracy in your model you must fabricate bent laminated parts for wing tips and the empennage. The flexibility of the supplied Tanganyika wood strips - especially when wet - makes this relatively easy. The necessary jigs are included in the kit. Because some of the curves are relatively tight, you may need to apply heat to the wood as you wrap it around a jig. This may be done with the angled tip of a 20-30 watt soldering iron. Firmly affix each jig, to a work board with a sheet of ordinary typing paper or newspaper sandwiched between the jig and the

board. This will prevent your gluing the formed part to the work board. The part will end up glued to the paper, but this easily sands off during the final finishing. Some people prefer to use waxed paper to prevent the part's sticking, but if you use heat against the jig, you will melt some of the wax into the laminated part.

Begin by soaking the wood in cold water for 5 or 10 minutes, then pat it dry. Starting at one end of the jig, pin the first strip tightly against the jig, applying heat when needed, then move along bending and pinning the wood to shape as you go. Cut off the excess strip at the end of the run.

Go back to the end where you started and brush on a thin coat of white glue or carpenter's glue and apply the second strip of wood, pulling and replacing pins as you go. Applying heat at this point will make an almost instant bond between the wood strips. Proceed in this manner until you have built up five wood strips and then allow the part to dry thoroughly, after which the formed shape will be permanent.

Carefully remove the part from its jig and sand off the excess glue and paper. The final step is to sand the correct profile as required by the instructions and full-size plans.

## Painting & Staining The Model

With one exception, your NIEUPOORT 28 model need not be painted or finished at all. However, it is recommended that you seal the wood parts and Britannia castings for protection. Due to the intricacy of the finished model, this is best done as you go. My personal preference is to use 3-pound cut shellac, thinned 50% with denatured alcohol. This dries fast, so you can keep working, and a second coat can be applied if you want more shine.

A light tan stain on all wooden parts will help to make the entire structure uniform in color. However, glue spots on the wood will resist staining, and any end grain will stain darker than the rest. To achieve an even application of stain, carefully scrape off any excess glue, then seal the wood - especially the end grain - with thinned shellac. After this is dry, a light application of stain, using a soft artist's brush, should give an even finish.

When dry, another application of shellac or your favorite varnish will complete the process.

Britannia castings parts may be left polished or painted a steel or gunmetal color. Other fittings, such as turnbuckles, can be painted black or dark gray. Varying the tones on the various parts will add a nice contrast to the finished model.

The distinctive woven plywood "peach basket" seat back is provided as a Britannia casting to simplify construction. You will need to paint this, after gluing it to the seat, to give it an appropriate wood finish. First paint the seat back with a very light tan. When this is thoroughly dry, dry-brush a light golden brown, allowing much of the tan to show through, then finish off with a russet brown wash to accentuate the pattern. A light coat of varnish will then give you the desired wood effect.

After you have shaped and finish sanded the laminated basswood propeller, you can achieve a more authentic look by staining it golden mahogany and then building up two or three thinned layers of varnish or shellac.

Sand all wood surfaces with 400-grit dry sandpaper and thoroughly wipe off all dust. A tack rag would be helpful.

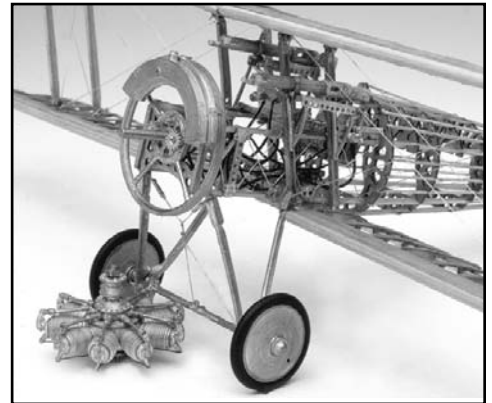
## Stage 1: Building the Engine

The Gnome-Rhone Monosoupape Type 9N rotary engine is essentially independent of the rest of the aircraft. It slips onto a fixed crankshaft around which the engine rotates. Super glue and/or epoxy should be used to assemble the parts. Care must be exercised with the many small parts. Refer to Figures 1/1 through 1/13. For clarity, drawings may show a single cylinder. It is a simple matter to repeat the assembly for the other eight cylinders. The actual assembly of the engine is pretty straightforward. The key to success is to carefully clean up all of the castings and then to dry fit everything before applying glue.

# Stage 1: Building the Engine

## PARTS LIST FOR STAGE 1:

GR9-01	Crankshaft mount	1	4mm diameter x 5mm brass tube
GR9-06	Camshaft box	1	Britannia casting
GR9-07	Crankcase covers	2	Britannia castings
GR9-08	Crankcase	1	Britannia casting
GR9-09	Distributor	1	Britannia casting
GR9-02	Front propeller flange	1	Britannia casting
GR9-04	Rear propeller flange	1	Britannia casting
GR9-03	Propeller (laminated)	3	Parts of laser-cut basswood 1/8" thick
J001	Propeller jig	1	1/4" X 20 bolt and nut
GR9-05	Timing gear cover	1	Britannia casting
GR9-10	Cylinders	9	Britannia castings
GR9-11	Cylinder heads	9	Britannia castings
GR9-12	Exhaust valve lifters	9	Britannia castings
GR9-13	Spark plugs	18	Britannia castings
WP—	Ignition wires	9	32-gauge black iron wires



### Crankcase; camshaft box; distributor:

Assemble the engine around the crankshaft mount (GR9-01). This will ensure that the parts line up properly. Be careful not to get any glue inside the crankshaft mounting tube.

Begin by attaching the distributor (GR9-09) to the crankshaft mounting tube (GR9-01) so that the tube end is flush with the gear side of the distributor. Slip one of the crankcase covers (GR9-07) onto the tube so that the detail side faces the distributor and line it up so that the nine rings on the distributor point between pairs of bolt heads. Next, slip on the crankcase (GR9-08) and the other crankcase cover. Glue the crankcase to the rear cover so that the drilled tabs on the distributor will line up between each pair of cylinders (Fig. 1/13). Before you glue on the front crankcase cover, align its bolt heads to match up with the ones on the rear cover.

Add the camshaft box (GR9-06) on the front of the crankcase, aligning the pegs dead center on each piston, slide the timing gear cover (GR9-05) onto the tube and then glue these parts together. Next, slip the nine cylinders (GR9-10) over the pistons and glue them in place, paying attention to the orientation of the spark plug ports. From the pilot's point of view, they are at the outer end of the cylinders, in the plane of the engine, facing to the right. Glue in the spark plugs (GR9-13).

Attach the cylinder heads (GR9-11) to the cylinders so that the peg on each lines up with its twin on the camshaft box. Make any needed adjustments to fit the exhaust valve lifters (GR9-12) between the pegs. Paint, weather, and highlight the motor, should you wish to do so.

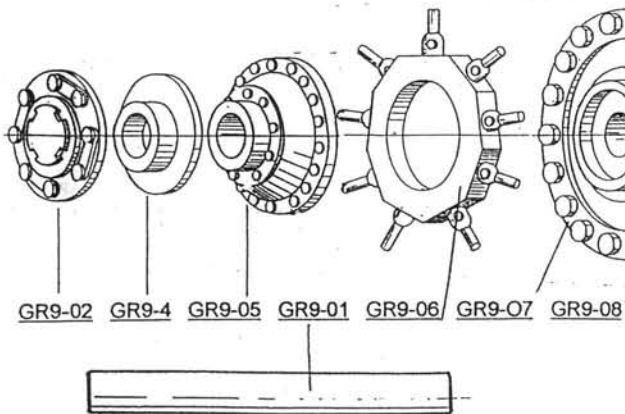
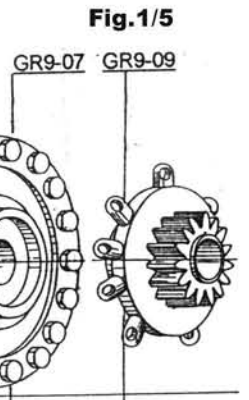
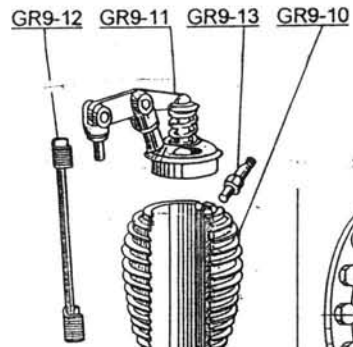
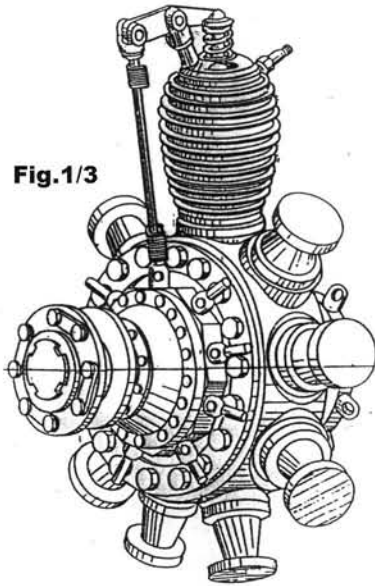
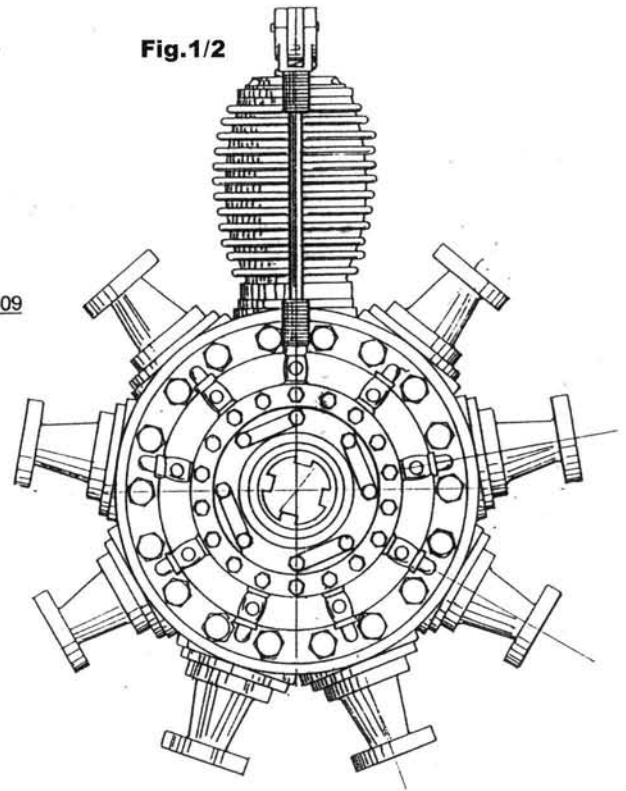
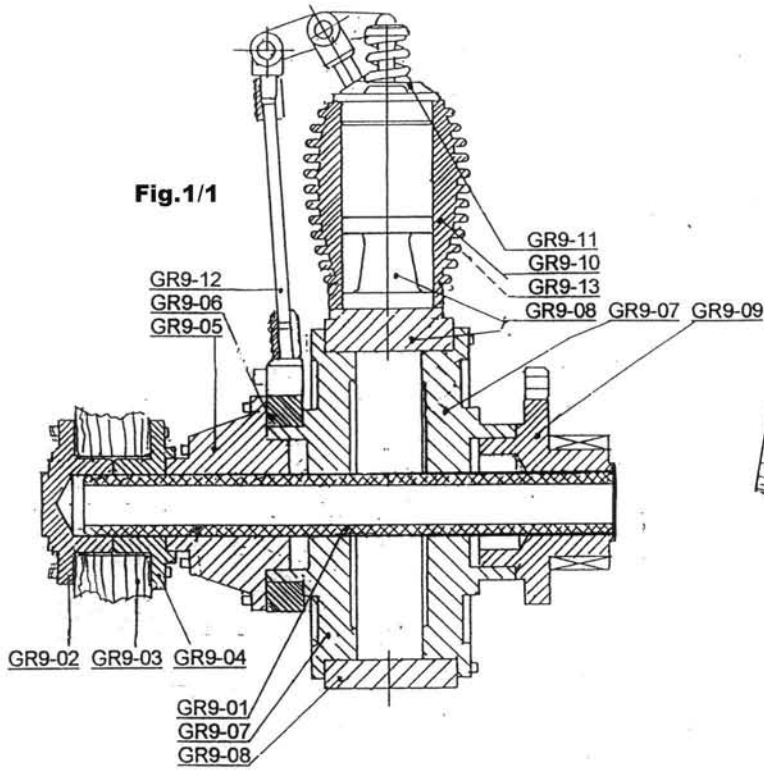
Complete this step by attaching the ignition wires (WP—) from the distributor to the spark plugs, referring to Figures 1/11-1/13. Cut nine 55mm lengths of wire. Thread each wire through one of the nine tabs on the distributor so that equal lengths emerge from each side. Twist the wire twice around itself at the ring, then run one end to each of the spark plugs at that cylinder and attach as in Figure 1/13. Trim off any excess wire.

### Propeller group:

Referring to actual-size Plan D04 in the instruction booklet, laminate the three propeller layers (GR9-03), using the provided bolt-and-nut jig (J001) to properly align the parts. Once the glue is dry, remove the bolt and file and sand the propeller to its refined shape. The front of the laminated propeller is stepped to guide you in filing the correct shape. The back is then shaped to follow the front. Begin with the overall lengthwise curve, then proceed to the cross-sectional shaping. Note that the front surface is slightly convex and the back surface is concave. Take your time and check the cross sections on the plan often. When you are satisfied with the result, apply at one thin coat of varnish or shellac. After the first coat is dry, lightly sand it with #400 paper to remove any grain raised by the varnish, then apply a gold-mahogany stain. When dry, follow this with a second coat of varnish or shellac. You can add a third coat of varnish, without sanding first, if that looks better to you.

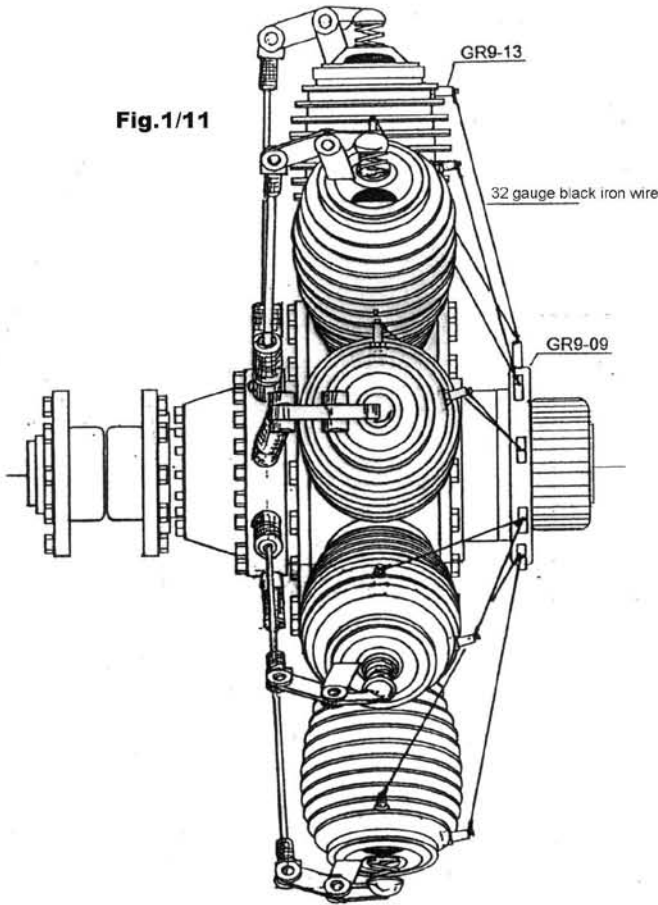
Paint, if desired, the front (GR9-02) and rear (GR9-04) propeller flanges before fitting them to the propeller. Referring to Figure 1/7, line up the molded-on front and rear bolt heads/nuts before gluing the flanges to the propeller. Dry fit this assembly onto the crankshaft mount. If necessary, file the end of the brass tube so that the propeller assembly snugs up to the timing gear cover, then, glue it in place.



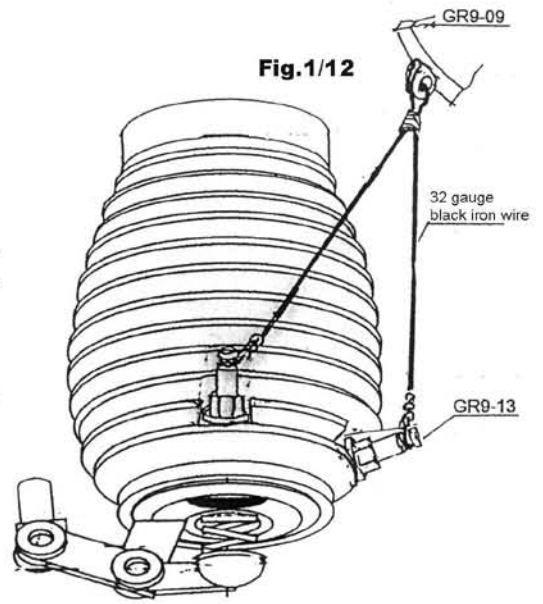


**Fig. 1/4**

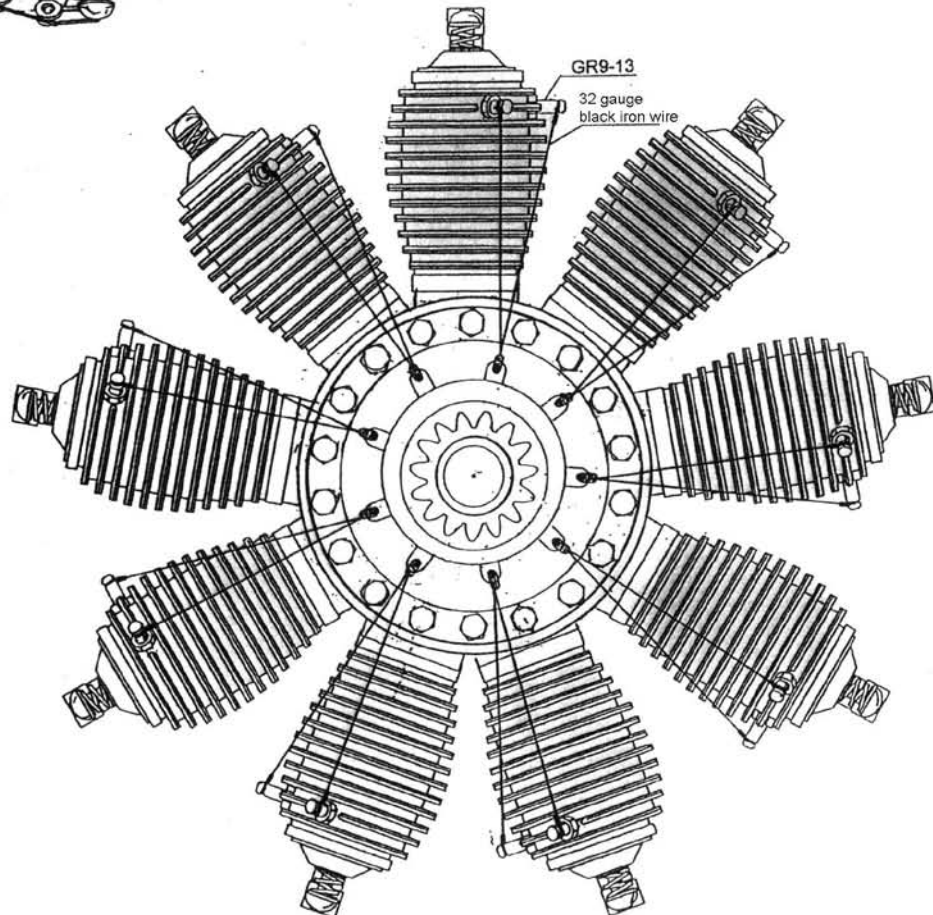
**Fig.1/11**



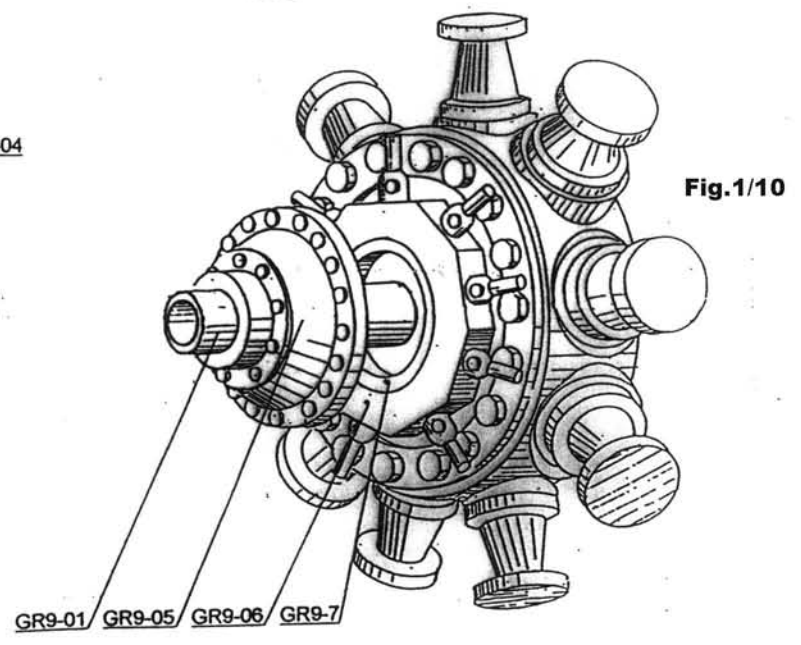
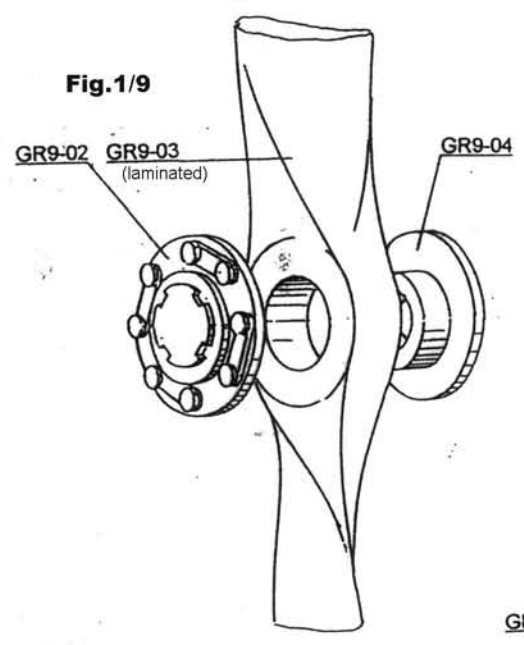
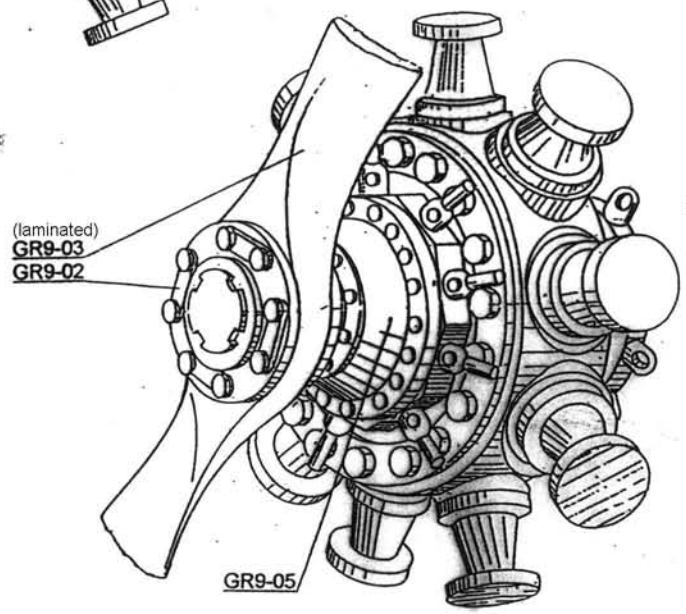
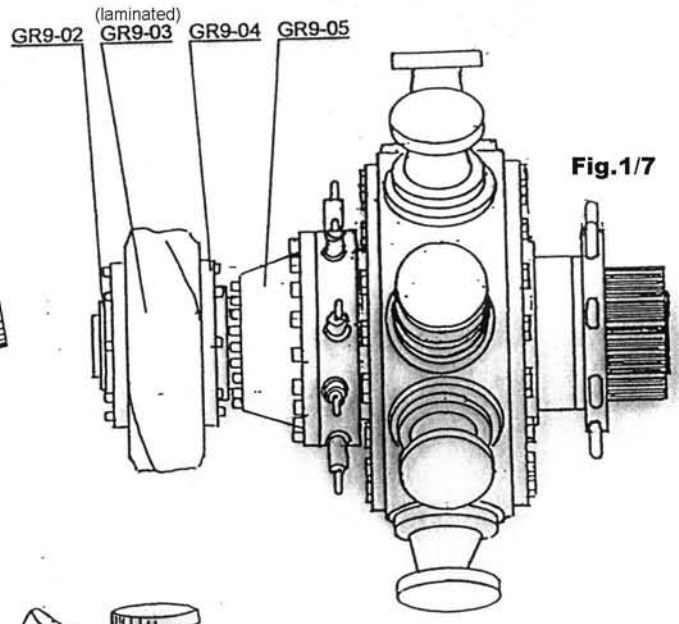
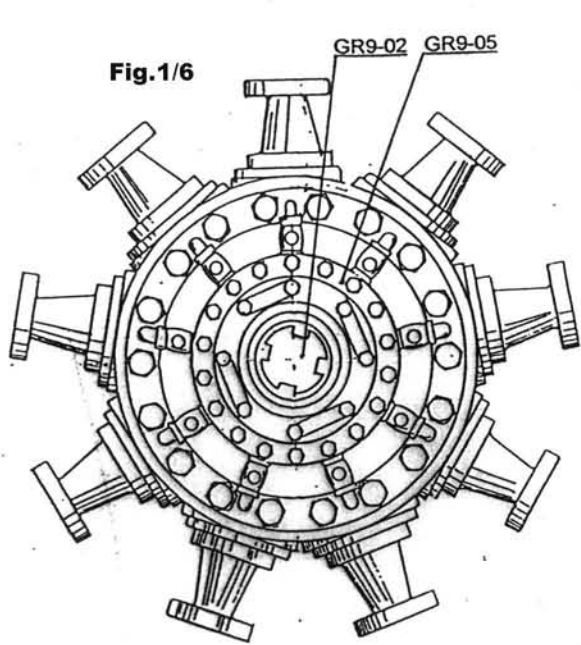
**Fig.1/12**



**Fig.1/13**







## Stage 2: Building the Upper Wing

The upper wing is built in two separate sections that will be joined later at the aircraft's center line. Refer to Figures 2/1 through 2/15 for the number and location of the parts. Ribs are numbered out from the centerline. The following procedures will need to be repeated for the right and left upper wings.

### PARTS LIST FOR STAGE 2:

Ni28-001	Ribs #1	4 laser-cut wood parts 3/64 thick
Ni28-002	Ribs #2	2 laser-cut wood parts 3/64 thick
Ni28-003	Ribs #3-10, 12	18 laser-cut wood parts 3/64 thick
Ni28-004	Ribs #11	2 laser-cut wood parts 3/64 thick
Ni28-005	Ribs #13	2 laser-cut wood parts 3/64 thick
Ni28-006	Ribs #14	2 laser-cut wood parts 3/64 thick
Ni28-007	Ribs #15	2 laser-cut wood parts 3/64 thick
Ni28-008	False ribs #A	2 laser-cut wood parts 3/64 thick
Ni28-009	False ribs #B	2 laser-cut wood parts 3/64thick
Ni28-017	Nose ribs	30 laser-cut wood parts 3/64 thick
Ni28-018	Compression bar	4 Britannia metal
Ni28-020	Joint pin plates	4 Britannia metal
WP3688-24	Rib caps	.02 x 5/64 wood strips
WP3688-24	Leading edge cover	7 .02 x 5/64 wood strips
WP3631-24	Front and rear spars	4 1/8 x 1/8 wood strips
WP3640-24	Leading edge	2 3/16 x 3/16 wood strips
WP3620-24	Trailing edge	2 1/16 x 1/8 wood strips
WP3202-40	Wing tips (laminated)	5 .02 x 5/32 Tanganyika wood strips
WP3202-40	Center trailing edge (laminated)	5 .02 x 5/32 Tanganyika wood strips
WP5101-24	Joint pins	2 1/8 x 1/4 wood dowels
W042	Turnbuckles	28 Britannia castings
WP1205	Rigging cable	7" Metal-gray thread
J002 R-L	Upper wing tips jigs	2 laser-cut wood parts 5/32 thick
J003	Upper center trailing edge jig	1 laser-cut wood part 5/32 thick

#### Wing ribs; cap strips:

Begin by laminating two parts Ni28-001 to form each Rib #1. Take the required lengths of the rib cap strips(WP3688-24) from full-size Plan D02. (Note that the rib cross sectional drawings are double size and reduce your measurements accordingly if you refer to these.) The rib cap strip edges will be flush with the sides of laminated ribs #1, but they must overlap the other ribs equally to each side. The easiest way to accomplish this is to pin each rib on its side, through the lightening holes, then slip a couple of pieces of .02" thickness wood strip between the rib and the assembly board. This will automatically set the required overlap when you glue on the cap strips. Hold the cap strips in place with pins while the glue dries.

#### Inserting the spars; leading edges; trailing edges:

Using full-size Plan D02, cut the front and rear spars(WP3631-24) to the required lengths. Carefully taper them from where they pass through rib #12 out toward the wing tip where the cross section should be reduced to 5/64 x 5/64. This should be done evenly from all four sides.

Next, adjust the spar holes in the ribs so the spars slip through without binding. Pin the assembly down, making sure everything is square, and glue the spars in place. Finally, cut the leading(WP3640-24) and trailing(WP3620-24) edges to size and glue them in place against the ribs.

After the glue dries thoroughly, unpin the structure. Using a long strip of sandpaper,

about 11", affixed to the same length straight piece of wood, sand the leading and trailing edges to the correct cross section. This technique will ensure a uniform shape.

Wing tips and center trailing edges; false ribs:

Here is where you will likely be expanding your skills, actually making shaped plywood by bending and gluing wood strips around a form. The procedure is the same for all four parts. Secure jigs J002 and J003 to a paper covered board. Referring to Plan D02 and Figures 2/7 and 2/8, cut five lengths of Tanganyika wood strips(WP3202-40) for each wing tip. Bend and glue the strips as described above, pinning the sandwich against a jig to establish the correct shape as the glue dries.

Remove the wing tips and center trailing edges from the jigs and shape them as necessary for installation on the wings. Note that Plan D02 shows mitered, not butt, joints where the wing tips are glued in place. This provides greater strength to the glue joint. Glue the false ribs(Ni28-008, Ni28-009) in place.

#### Nose ribs; leading edge cover:

Using Plan D02 as a guide, glue the nose ribs(Ni28-017) in place. After the glue is dry, a light sanding, if needed, with the sanding paddle will ensure both ribs and nose ribs perfectly line up on the upper wing surface.

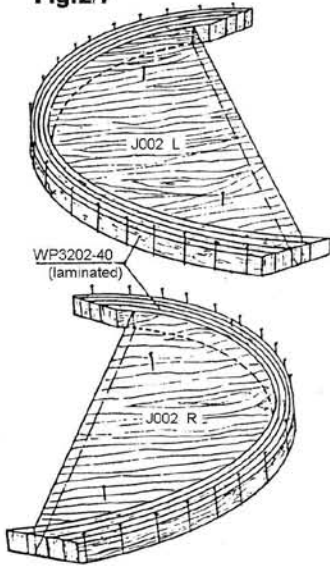
Glue the eight strips of the leading edge cover(WP3688-24) in place, proceeding from the leading edge toward the forward spar. After the glue is dry, sand the ends to conform to the wing's shape and sand the cover to a smooth surface. [The kit simplifies the rear edge of the leading edge cover by leaving it straight across. In the actual aircraft, this was shaped into a forward, flattened arc between each pair of ribs, for an overall scalloped effect. If the advanced modeler wants to make this modification, be careful that the arcs have a uniform amplitude.]

#### Compression bars; rigging:

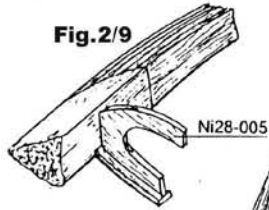
Referring to Figure 2/10 and Plan D02, use a bent pin, working in from both sides, to carefully bore 0.5mm(.020") holes through ribs #1, 4, 6, 8, 13 and 15 for the rigging(WP1205) to pass through against the spars.

Precisely align the compression bars(Ni28-018) and glue them in place.

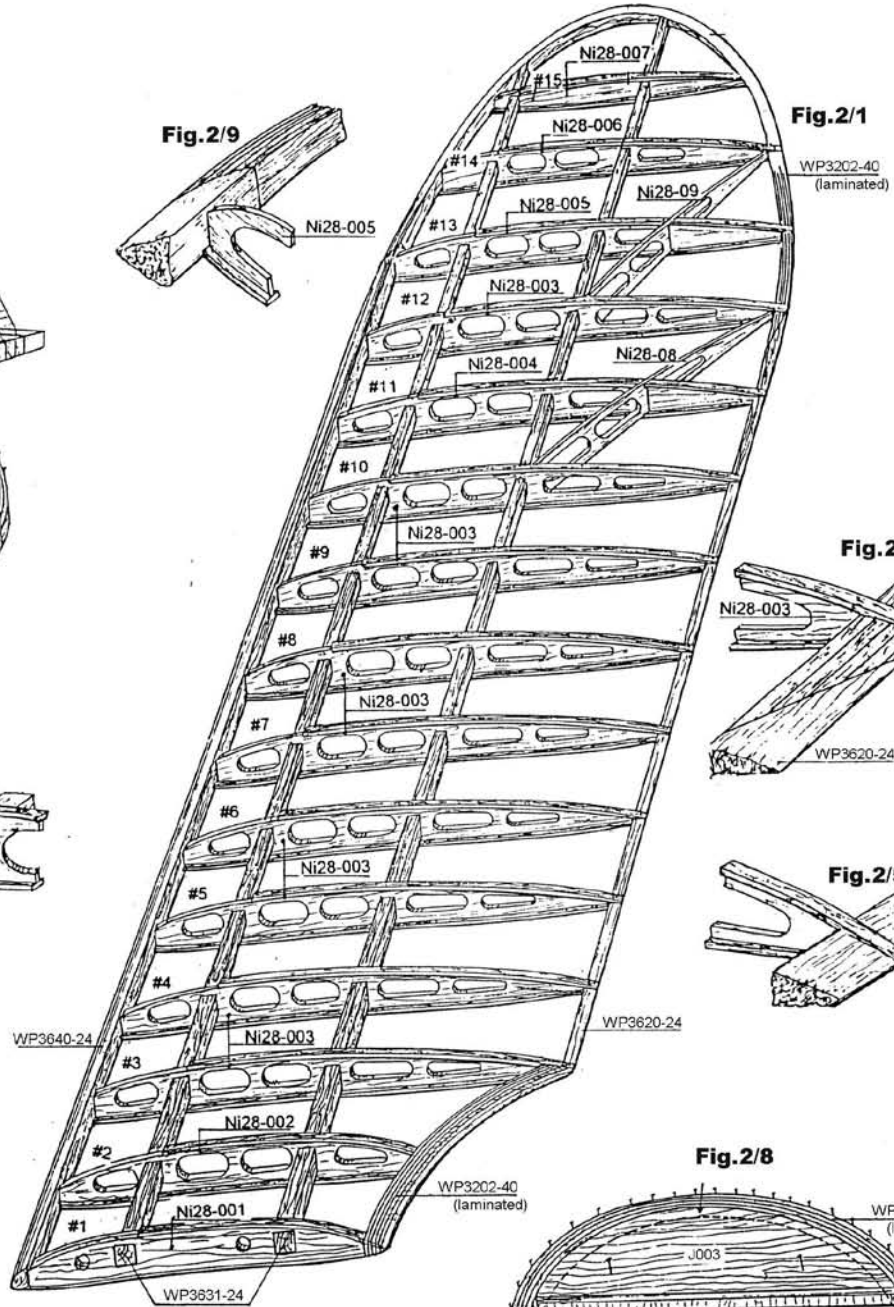
**Fig.2/7**



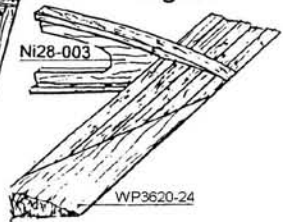
**Fig.2/9**



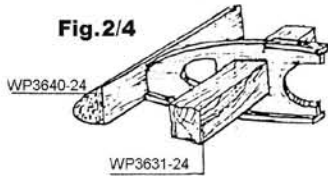
**Fig.2/1**



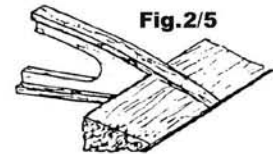
**Fig.2/6**



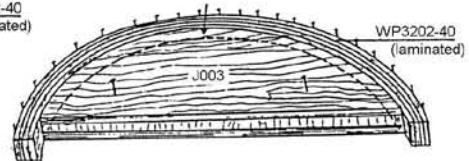
**Fig.2/4**



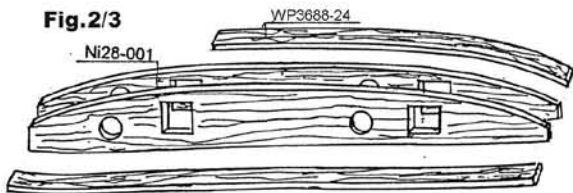
**Fig.2/5**



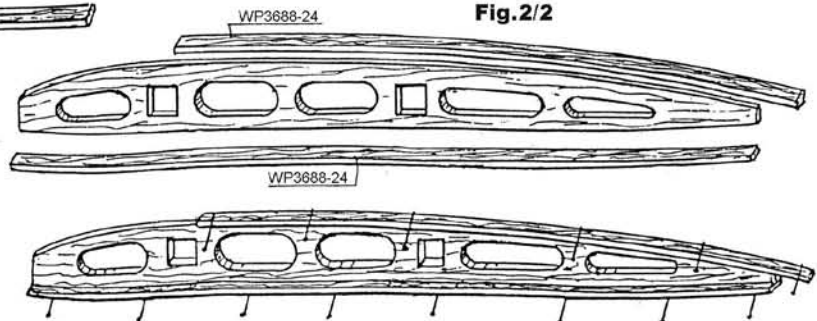
**Fig.2/8**



**Fig.2/3**



**Fig.2/2**





Next, tie turnbuckles(W042) where indicated to the compression bars and to the holes in ribs #6 and #15. You will use 14 turnbuckles for each half of the upper wing. Begin each run of the rigging line by tying one end to a turnbuckle and permanently affixing it with a drop of super glue. Run the line through the holes as indicated, ending through the second turnbuckle. Affix a small weight on the line to keep it taut (Fig. 2/13-D) and seize thread around the line at that point. Apply a drop of super glue there and at each place the line passes through a rib. Cut off the excess line and repeat the procedure until all of these alignment lines are in place. Note that the lines connect directly to rib #1, without a turnbuckle.

Joining the wing halves:

This step requires patience in order to get the correct 1.5 degrees dihedral when joining the upper wing halves and a little

extra care to avoid making your fingers part of the assembly. Begin by taping a 5mm high riser block, cut from spare wood strips, to rib #12 on each wing half. [Note that this varies slightly from Fig. 2/15.] Next, insert the two joint pins (WP5101-24) through ribs #1. There should be just enough play so that, with the top of ribs #1 touching, the center of the assembled wing can sag to the table top. Super glue the topside contact edges together.

When the glue is hard, carefully turn the assembly over and run a drop of super glue into the gap to lock the joint pins in place and to strengthen the joint. Finally, shape a shim to fit the gap(Fig.2/14), without prying it apart, and glue this in place with white or yellow glue. After everything is dry, finish off the wing by sanding the joint as needed and affixing the four joint plates(Ni28-020).

## Stage 3: Building the Lower Wing and Ailerons

The lower wing will also be constructed in right and left halves, but there will be no dihedral when they are attached to the fuselage. The ailerons are built integral to the wing structure and will then be cut free to operate. This ensures that it all lines up perfectly. Refer to Figures 3/1 through 3/10 for the number and location of the parts. As before, ribs are numbered out from the centerline. The following procedures will need to be repeated for the right and left lower wings.

### PARTS LIST FOR STAGE 3:

WP3688-24	Rib caps	.02 x 5/64 wood strips
Ni28-021	Ribs #1	4 laser-cut wood parts 3/64 thick
Ni28-022	Ribs #2	2 laser-cut wood parts 3/64 thick
Ni28-023	Ribs #3, 5	4 laser-cut wood parts 3/64 thick
Ni28-024	Ribs #4, 6	4 laser-cut wood parts 3/64 thick
Ni28-025	Ribs #7, 8, 10, 11	8 laser-cut wood parts 3/64 thick
Ni28-026	Ribs #9	2 laser-cut wood parts 3/64 thick
Ni28-027	Ribs #12	2 laser-cut wood parts 3/64 thick
Ni28-028	Ribs #13	2 laser-cut wood parts 3/64 thick
Ni28-029	Ribs #14 - ailerons only	2 laser-cut wood parts 3/64 thick
WP3626-24	Front and rear spars	2 3/32 x 1/8 wood strips
WP3202-40	Wing tips (laminated)	5 .02 x 5/32 Tanganyika wood strips
WP3202-40	Center trailing edges (lam.)	5 .02 x 5/32 Tanganyika wood strips
WP3640-24	Leading edge	2 3/16 x 3/16 wood strips
WP3620-24	Trailing edge	2 1/16 x 1/8 wood strips
WP3688-24	Leading edge cover	5 .02 x 5/64 wood strips
WP40264	Aileron torque bars	2 5/64 x 9 1/4 brass rod
Ni28-033	Aileron hinges	6 Britannia castings
Ni28-034	Lower wing joint	1 Britannia casting
Ni28-018	Compression bars	2 Britannia casting
W042	Turnbuckles	16 Britannia castings
WP1205	Rigging cable	7' Metal-gray thread
J004 R-L	Lower wing tip jigs	1 laser-cut wood part 5/32 thick
J005 R-L	Lower center trailing edge jigs	1 laser-cut wood part 5/32 thick

Wing ribs; cap strips:

Prepare the lower wing ribs(Ni28-021-029) and cap strips(WP3688-24) exactly the way you did for the upper wing. Begin by laminating two parts Ni28-021 to form each rib #1. Take the required lengths of the cap strips from full-size Plan D02.

Wing tips and center trailing edges:

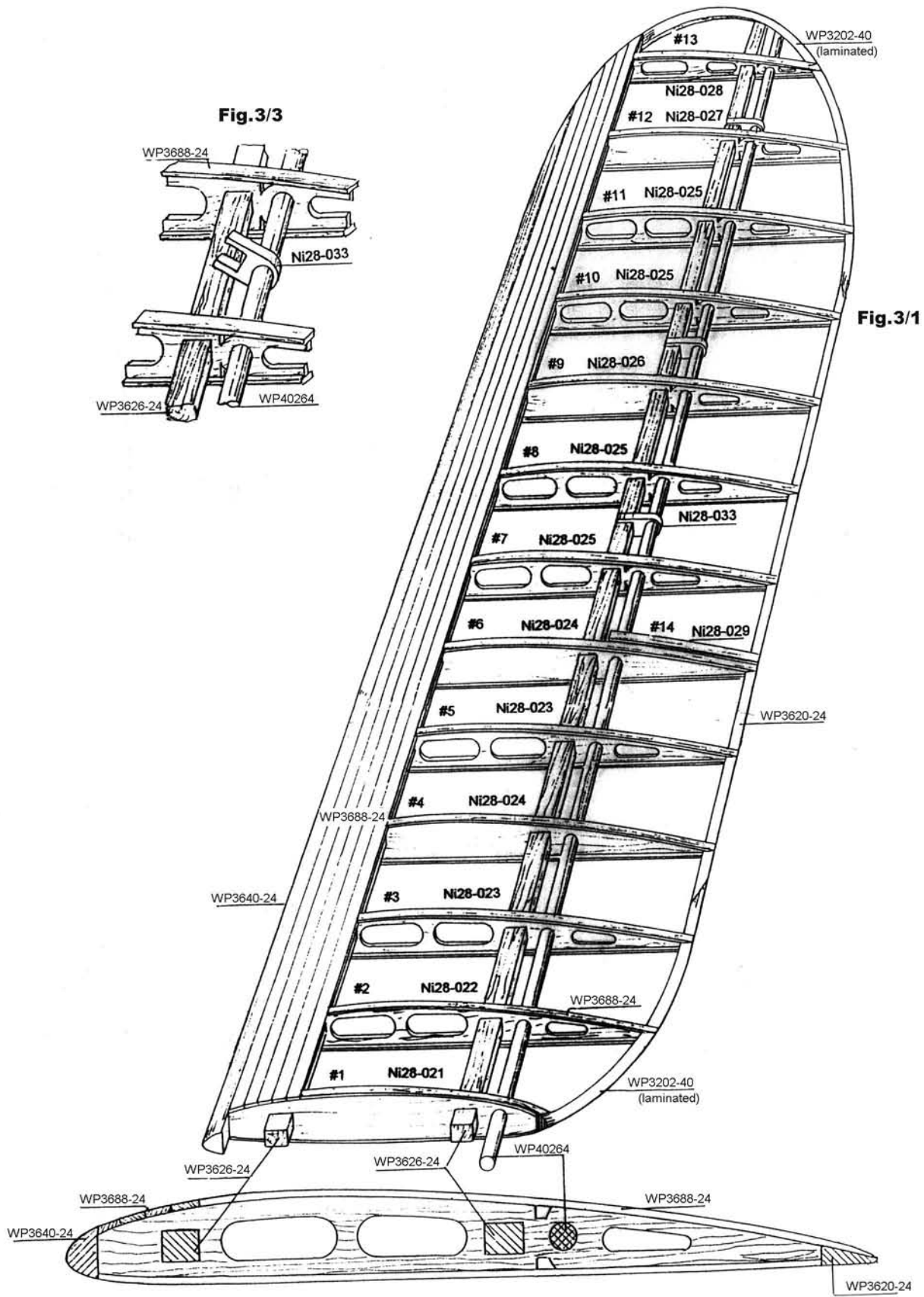
The technique is the same as for the likewise laminated parts for the upper wing, using five Tanganyika wood strips(WP3202-40). In this case, use jigs J004 and J005 and refer to Plan D02. As before, shape the laminated parts as necessary for installation on the wings.

Inserting the spars; leading and trailing edges; aileron torque bars; aileron hinges:

Referring to full-size Plan D02, cut the front and rear spars (WP3626-24) to length and shape them as required. Adjust the spar holes in the ribs so the spar slips through without binding, then cut and insert the aileron torque bar(WP40264), adding rib #14 between ribs #6 and 7, and the hinges(Ni28-033) between ribs #7 and 8, #9 and 10, and #12 and 13. These should turn freely on the torque bar. The leading edge, spars and torque bar will protrude through rib #1. Pin the assembly down, making sure everything is square, then glue the spars in place.

The torque bar should be glued only to ribs #7-14 and be able to turn without binding in the other ribs. Do not glue the hinges to the rear spar. This will be done after the aileron is cut free from the wing and sanded to its final shape.

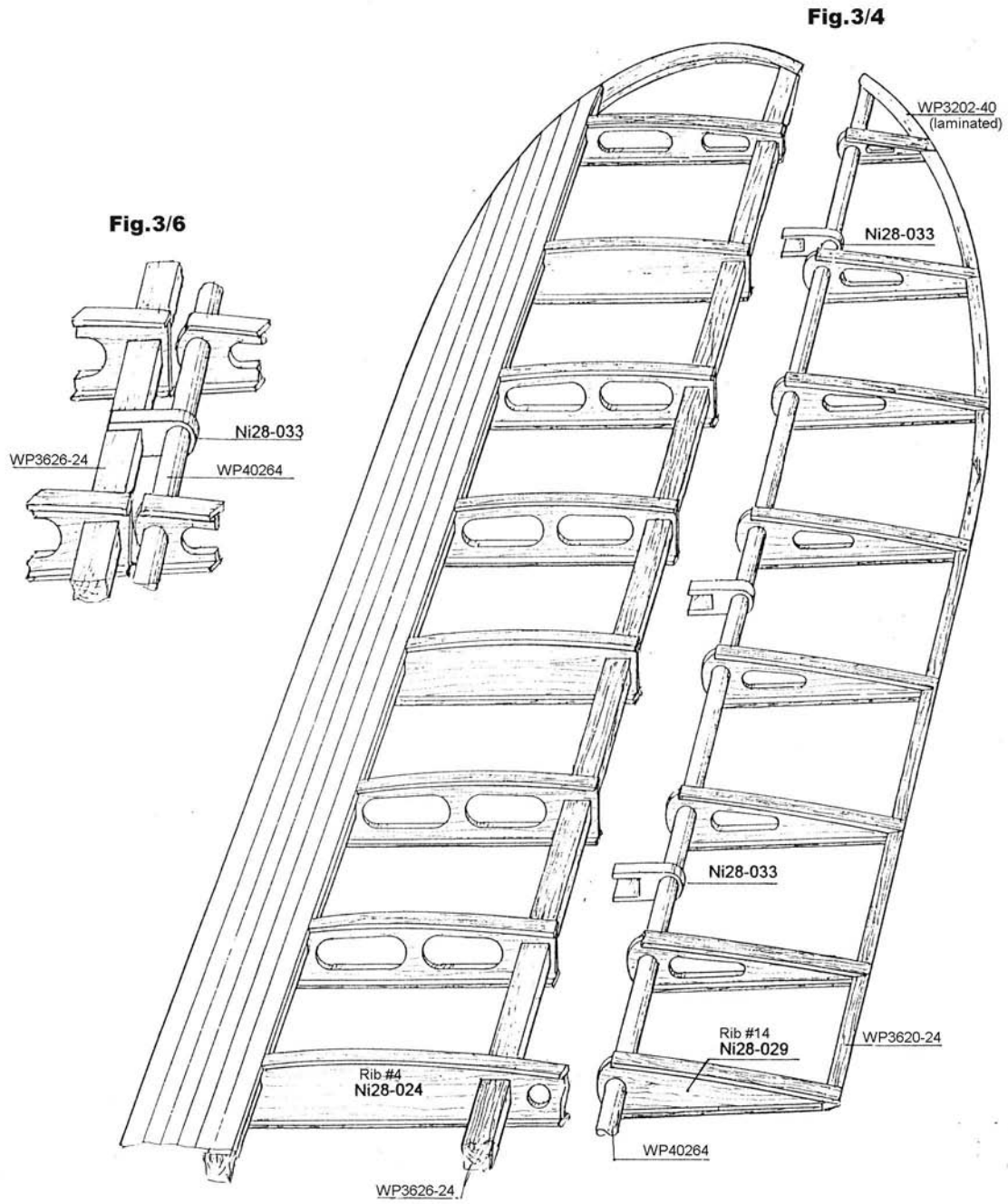
Finally, cut the leading (WP3640-24)and trailing(WP3620-24) edges to size and glue them in place against the ribs, then add the laminated wing tips and center trailing edge as for the upper wing. After the glue dries thoroughly, unpin the structure. Using a long strip of sandpaper (about 11") affixed to the same length straight



**Fig. 3/2**

**Fig. 3/1**

**Fig. 3/3**



piece of wood, sand the leading and trailing edges to the correct cross section. This technique will ensure a uniform shape.

#### Leading edge cover:

Glue the four strips of the leading edge cover(WP3688-24) in place, proceeding from the leading edge to the forward spar. After the glue is dry, sand the ends to conform to the wing's shape and sand the cover to a smooth surface. [Once again, the advanced modeler may want to scallop the rear edge of the cover.]

#### Separating the aileron:

Referring to Figures 3/4 and 3/5, cut through the wing tip and ribs #7-13 between the rear spar and the torque bar, and through the trailing edge between ribs #6 and #14. A razor saw is recommended for this. Remove the aileron by sliding the torque bar from ribs #1-6.

Referring to Figure 3/5, sand the aileron

ribs to shape. Next, re-insert the torque bar through ribs #1-6. Do not glue it. Finally, glue the aileron hinges(Ni28-033) to the rear spar where indicated.

#### Rigging:

Referring to Figures 3/9 and 3/10 and Plan D02, use the bent pin again to bore .5mm(.02i) holes through ribs #1, 4, 6, 9 and 12 for the rigging to pass through against the spars.

Insert the compression bar(Ni28-018) between ribs #9 and #10 on the lower wing so it precisely aligns with the compression bar on the upper wing and glue it in place.

Each run of rigging line(WP1205) between the solid ribs is attached at only one end to a turnbuckle(W042). You will use eight turnbuckles for each half of the lower wing. The easiest way to run this rigging is to tie off the two turnbuckles to the inner side of rib #9, then run continu-

ous lengths of line from those turnbuckles to rib #1. Each time the line emerges through a rib, thread it through both holes on a turnbuckle (instead of tying it off) and proceed to the end of the run. Put a small weight on the excess line to ensure it is taut, then glue the line in place at rib #1 and cut off the excess line. Thereafter, slide the loose turnbuckles against the appropriate ribs and glue them and the line in place. Proceed more or less the same way from the compression bar out to rib #12. A daub of paint, matching the turnbuckle, placed over the rigging line on each turnbuckle will hide the line, if you choose the continuous run method of rigging.

#### Joining the wing halves:

Referring to Figure 3/7, glue the lower wing joint(Ni28-034) to the right and left lower wing halves, positioning casting tight to the front spar. The finished wing should line up straight across the leading edge and with no dihedral.





Fig.3/10

Fig.3/7

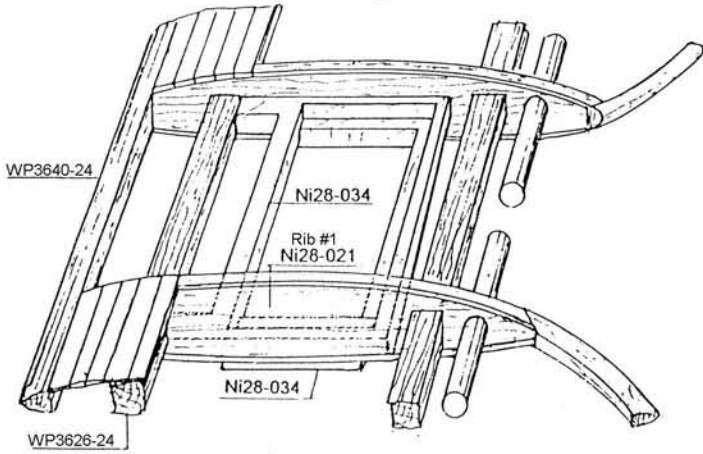


Fig.3/9

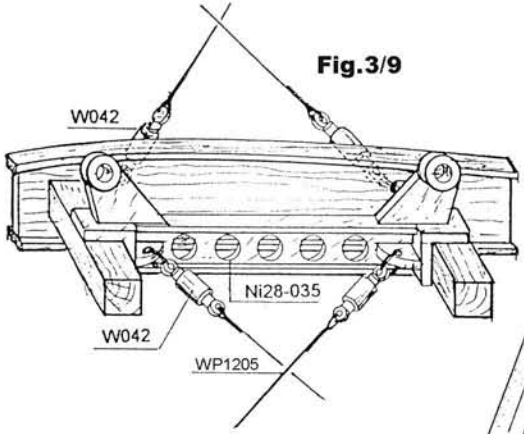
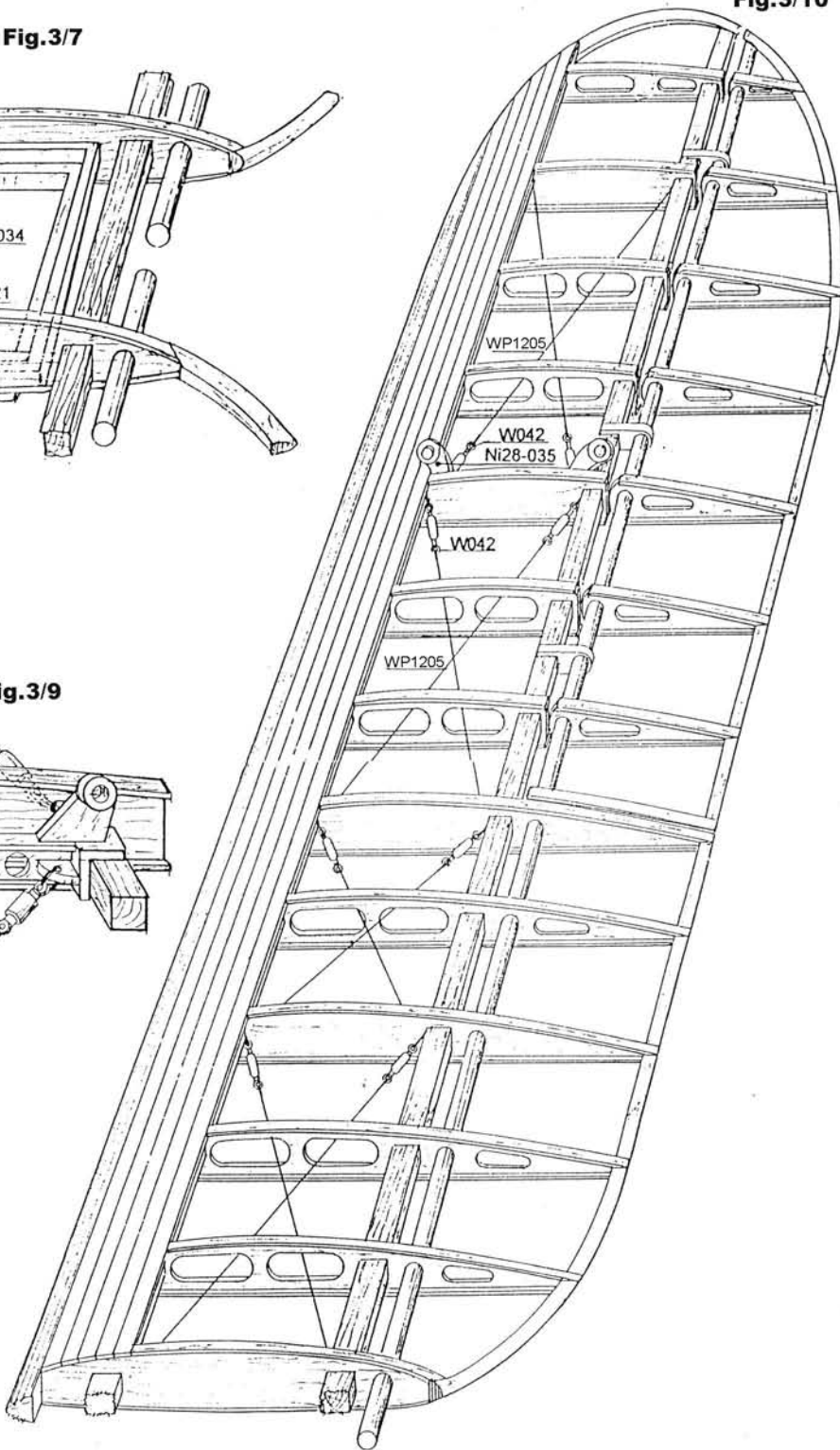
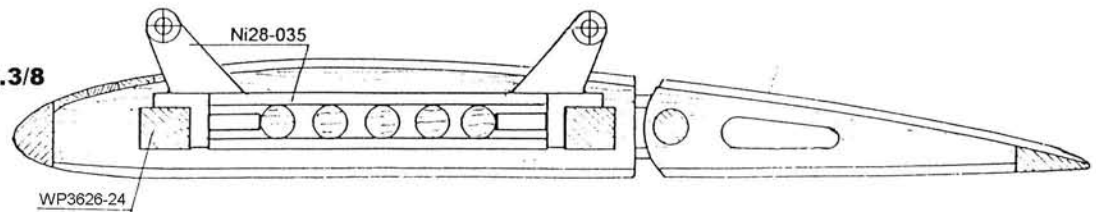
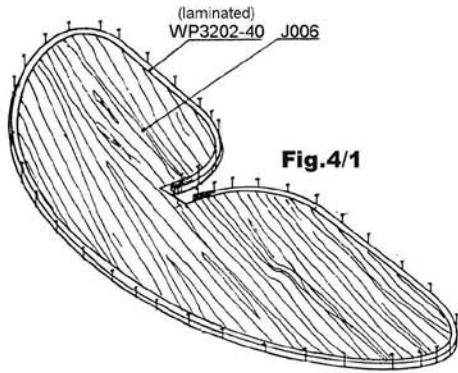
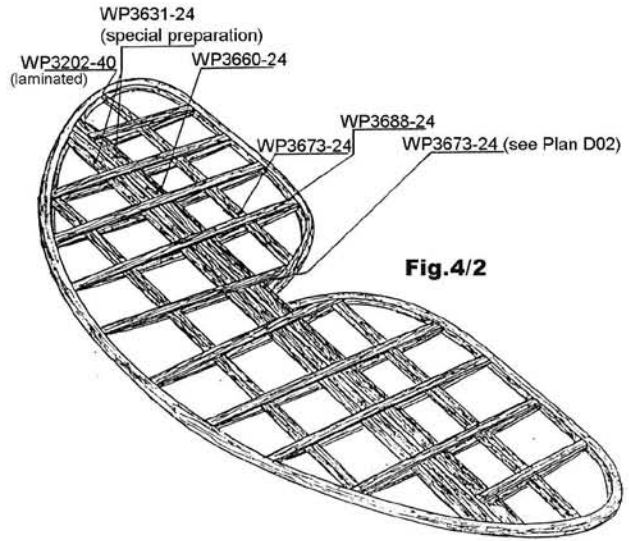


Fig.3/8

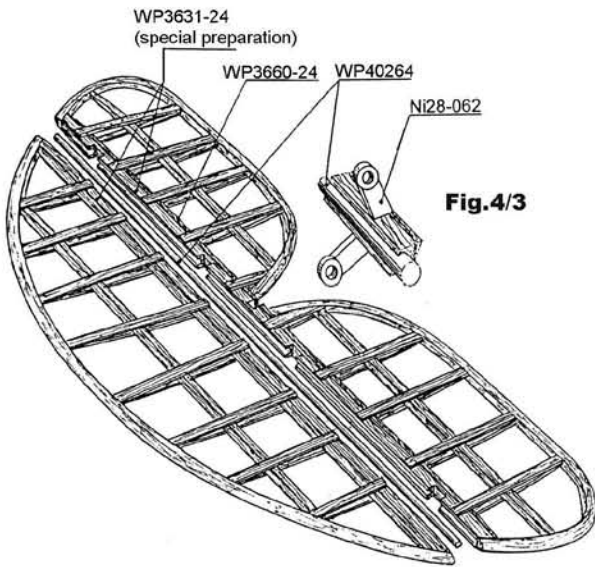




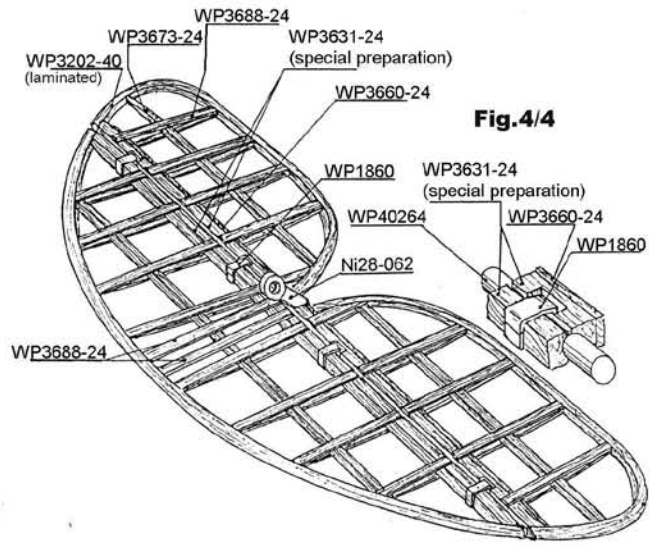
**Fig.4/1**



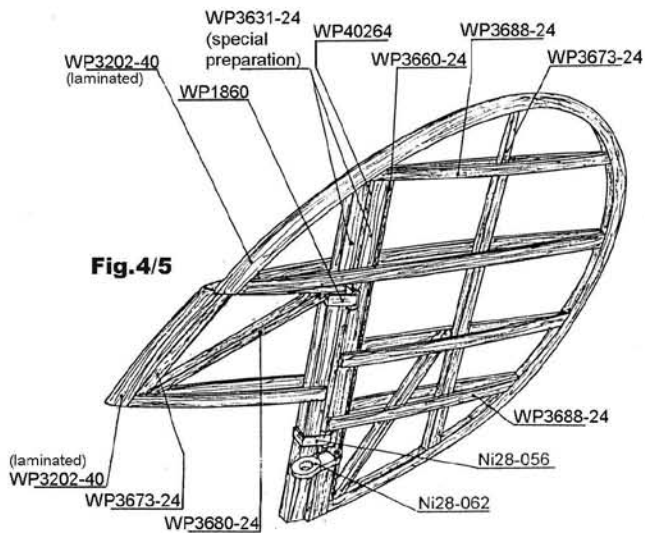
**Fig.4/2**



**Fig.4/3**



**Fig.4/4**



**Fig.4/5**

## Stage 4: Building the Empennage

As you did with the ailerons on the lower wing, the horizontal stabilizer and the vertical stabilizer (or fin) will be built with the elevator and the rudder attached and then cut loose. Reference Figures 4/1 through 4/5 while you construct them on full-size Plan D02.

### PARTS LIST FOR STAGE 4:

WP3673-24	Leading edge brace	2	5/64 x 5/64 wood strips
WP3680-24	Diagonal brace	2	3/64 x 3/64 wood strips
WP3688-24	Fin attachment supports	2	.02 x 5/64 wood strips
WP40264	Elevator pivot rod	1	5/64 x 5 1/2 brass rod
WP40264	Rudder pivot rod	1	5/64 x 2 1/4 brass rod
WP3202-40	Stabilizer rim (laminated)	5	.02 x 5/32 Tanganyika wood strips
WP1860	Hinges	6	1/4" aluminum tape strips
WP3631-24	Stabilizer & elevator spars	2	1/8 x 1/8 wood strips ñ special prep
WP3660-24	Elevator brace	1	3/64 x 1/8 wood strip
WP3673-24	Fin braces	2	5/64 x 5/64 wood strips
WP3688-24	Ribs	14	.02 x 5/64 wood strips
Ni28-062	Control horns	2	Britannia metal
WP3202-40	Rudder rim (laminated)	5	.02 x 5/32 Tanganyika wood strips
WP3673-24	Vertical brace	1	5/64 x 5/64 wood strip
WP3660-24	Vertical brace	1	3/64 x 1/8 wood strip
WP3631-24	Rudder post & main spar	2	1/8 x 1/8 wood strips ñ special prep
J006	Stabilizer/elevator jig	1	laser-cut wood part 5/32 thick
J007	Fin/rudder jig	1	laser-cut wood part 5/32 thick

#### Stabilizer and elevator:

This one is the real test of your bent lamination skill. The stabilizer rim is a continuous lamination that runs completely around both the stabilizer and the elevator. This ultimately will give you the leading edge of the stabilizer and the trailing edge of the elevator. Laminate the stabilizer rim using five Tanganyika wood strips(WP3202-40) against jig J006 to form the correct shape. Make sure the glue is completely dry before you unpin the shape from the jig.

Cut to length and glue in the stabilizer and elevator spars using 3x3mm wood strips(WP3631-24). These require special preparation before attaching. One face must be grooved into a shallow channel that will locate the pivot rod(WP40264) when the grooved sides face each other. See Plan D02. The easiest way to cut the groove is to score it the length of the strip with a razor saw, then to file the channel with a round riffler. The angle of the file end of a riffler to the center handle makes it easier to keep your hand out of the way. It is important that the pivot rod not be completely enclosed when sandwiched between these spars, otherwise the elevator will not operate.

The elevator brace is made from 1x3mm wood strip(WP3660-24), the fin braces and the leading edge brace from 2x2mm wood strip(WP3673-24). Next add wood strips(WP3688-24) to create the topside ribs in an airfoil contour. Turn the assembly over and glue on the underside ribs, then add the two fin attachment supports from wood strips(WP3688-24). When all is dry, saw through the rim and ribs where indicated in Figure 4/3 to separate the elevator from the stabilizer.

Referring to full-size Plan D02 and Figure 4/4, cut four dadoes into the elevator spar to clear the outside of the elevator hinges. Next, glue the elevator pivot rod(WP40264) into the groove of the elevator spar. Locate and attach the control horn(Ni28-062) to the

center of the elevator leading edge. Finally, cut the indicated lengths from the 1/4" aluminum tape(WP1860). Carefully fold the strip lengthwise in half, adhesive side inside, then trim to 3/16" wide and bend the hinges. They pass through the slot created by gluing the pivot rod to the elevator spar and are glued around the stabilizer spar only.

#### Fin and rudder:

The procedure for constructing the fin and rudder is essentially the same as for the stabilizer and elevator. Especial care must be taken in building the fin because the elevator control horn must later be located within this structure.

Begin by forming the rim from five wood strips(WP3202-40) around jig J007. Prepare the rudder post and main spar(WP3631-24) with a groove, as you did for the stabilizer and elevator spars. Glue these in place, making sure the grooves face each other. Make the leading edge brace from WP3673-24, vertical braces from WP3673-24 and WP3660-24 as indicated, and diagonal braces from WP3680-24. Complete this step by adding the ribs from WP3688-241 to achieve a like curvature on both sides. Note how the ribs are paired on both sides of the horizontal joint between the fin and the rudder (Plan D02).

Referring to full-size Plan D02, saw the rudder from the fin and cut two dadoes into the rudder spar. Attach the rudder pivot rod(WP40264) to the rudder spar and make hinges from the aluminum tape(WP1860) the same way you did for the elevator. Finally, locate and attach the control horn(Ni28-062) to the rudder.



# Stage 5: Building the Fuselage

Initially, the fuselage will be assembled upside down on a special jig and then turned right way around and supported by two stands for completion. Refer to Figure 5/1 for the location of the fuselage construction jig parts (J008-J018). Check that all attachment edges are square and that all parts are aligned and square to the base as you glue the jig together. Taking the time to carefully prepare this jig will result in more successful assembly of the fuselage. The central, longitudinal section of the assembled jig extends below the crosspieces, against which the fuselage formers will be aligned. This slips into a slot formed by cutting part J019(WP——) in half and gluing the resulting 300mm lengths to a baseboard that you supply. This same base will be used later for the fuselage support stands.

## PARTS LIST FOR STAGE 5:

WP3673-24	Longerons	4	5/64 x 5/64 wood strips
Ni28-037-046	Fuselage formers #1,2,4-10	9	laser-cut wood parts 1.5mm thick
WP3680-24	Stringers	23	3/64 x 3/64 wood strips
WP3631-24	Tail frame	1	1/8 x 1/8 wood strip
WP3673-24	Braces	7	5/64 x 5/64 wood strips
Ni28-053	False frame	1	laser-cut wood parts 1/16 thick
Ni28-054	False frame	1	laser-cut wood parts 1/16 thick
WP3631-24	Braces	4	1/8 x 1/8 wood strips
WP1205	Rigging cables	7'	Metal-gray thread
J008-018	Fuselage construction jig	11	laser-cut wood parts 5/32 thick
WP——	J019 - Fuselage jig base strips	2	3/16 x 1 wood strips
J020-023	Fuselage support stand	4	laser-cut wood parts 5/32 thick
	Baseboard	1	supplied by modeler

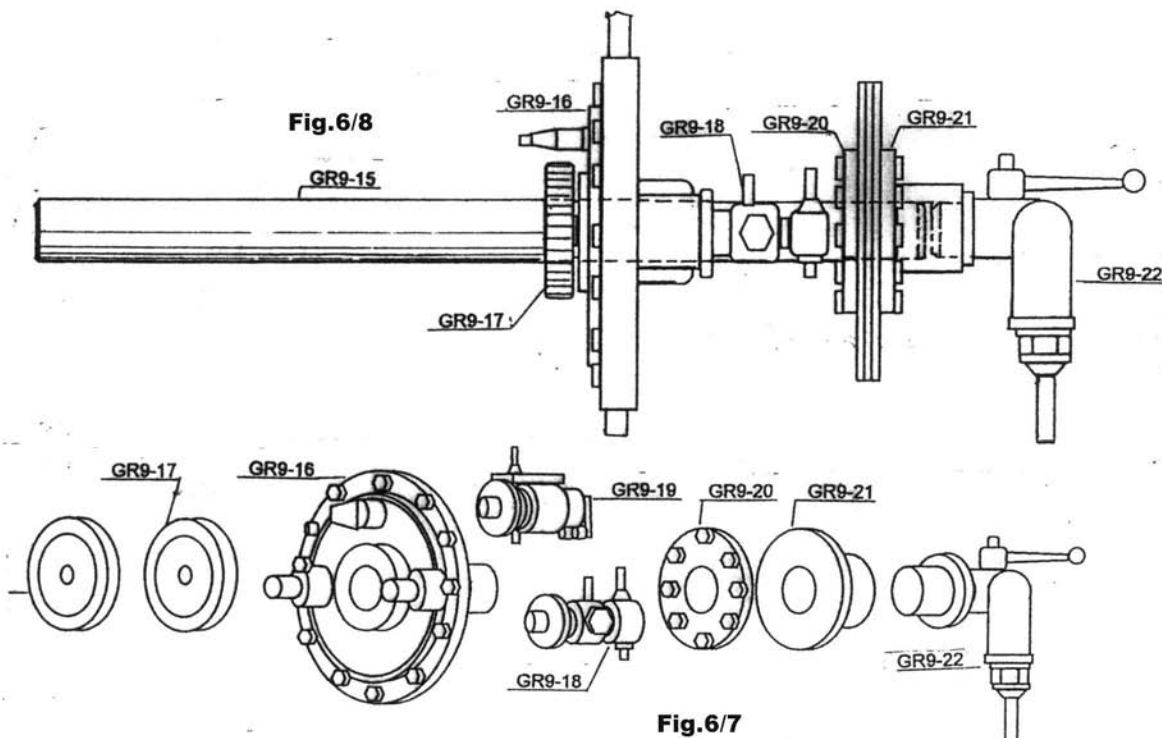
Fuselage formers; longerons; stringers:

Referring to full-size Plan D03, cut the four longerons to length from 5/64 x 5/64 wood strips(WP3673-24). Slip on the nine Fuselage formers(Ni28-037, 039, 040-046) in order, then turn this upside down and nestle it onto the fuselage construction jig. Clip the bulkheads against the forms and, without gluing anything yet, carefully check the alignment. The rearmost former is simply a length of 1/8 x 1/8 wood(WP3631-24). Begin gluing from the rear by joining the rear end of two top and the two bottom longerons and then these to the tail frame, as in Figures 5/7 and 5/3. Where former #3 would go, glue in two lengths of WP3673-24 between the upper and lower longerons.

After the formers are firmly glued to the longerons, get out the bent pin again and bore holes through the formers #4 through #10 between the longerons. (See Figure 5/5.) Criss-cross the bracing wires (WP1205) through the holes in the formers alongside the longerons. Using the previously described weight technique, secure the thread with glue at each former.

Glue the stringers, made from 1x1mm wood strips (WP3680-24), in place along the fuselage sides and bottom, connecting formers #4 through #9.

Remove this sub-assembly from the construction jig and turn it right side up. Remove the construction jig from the base and replace it with the support stand made from parts J020-023. With the fuselage supported on the stand, attach false frames Ni28-053 and Ni28-054, then glue on the rest of the stringers. Complete this step by attaching the braces, from WP3631-24 and WP3673-24, as indicated in Figures 5/6 and 5/7.



FUSELAGE ASSEMBLY JIG

Fig.5/1

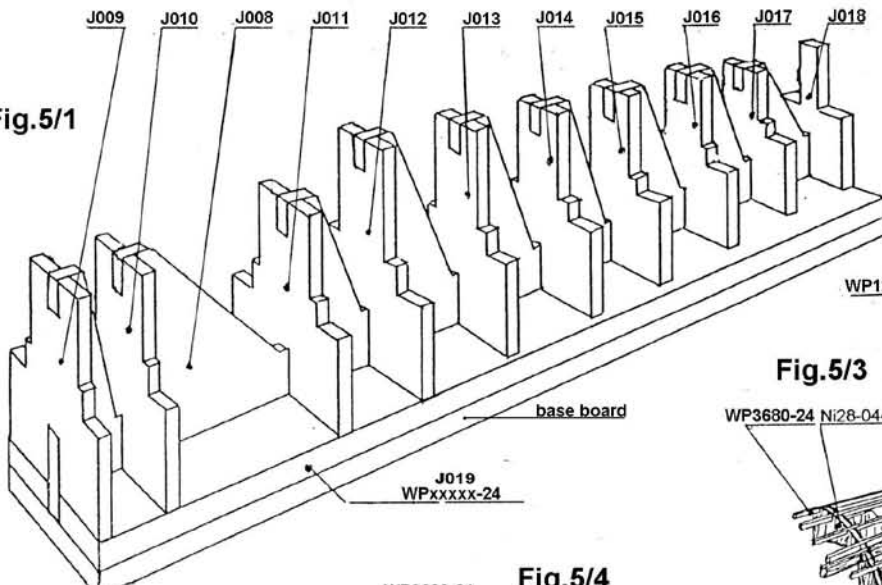


Fig.5/2

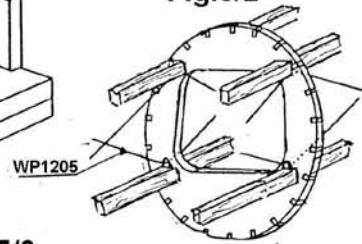


Fig.5/3

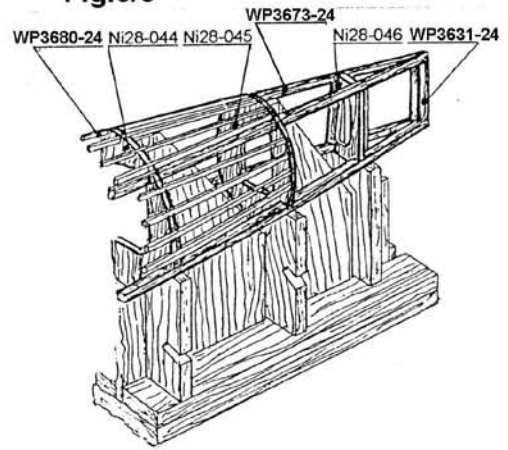


Fig.5/4

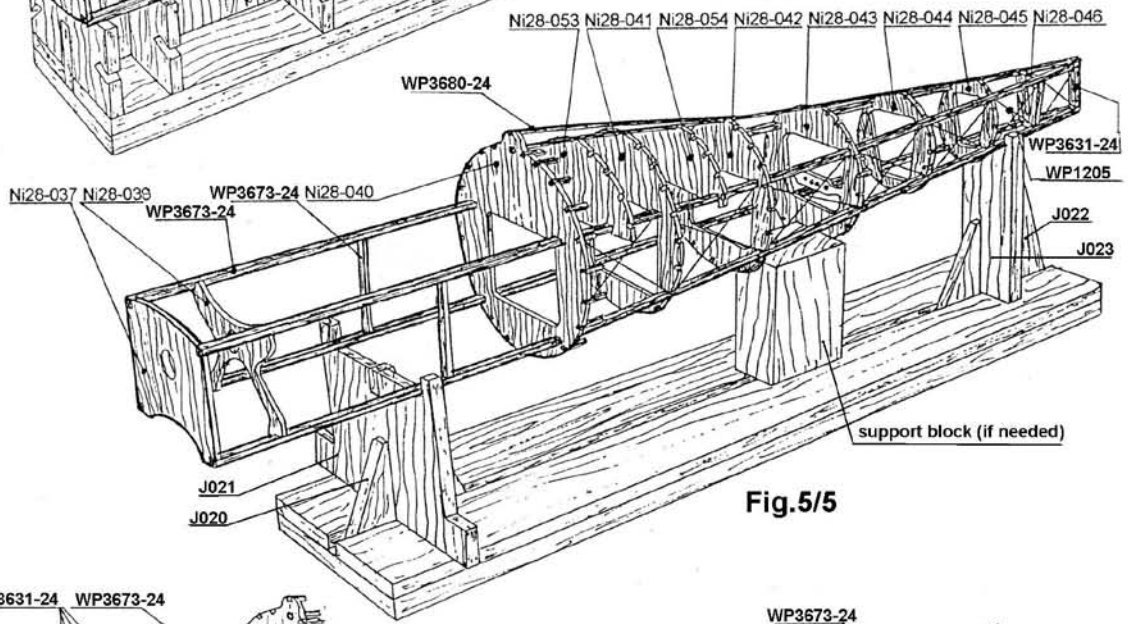
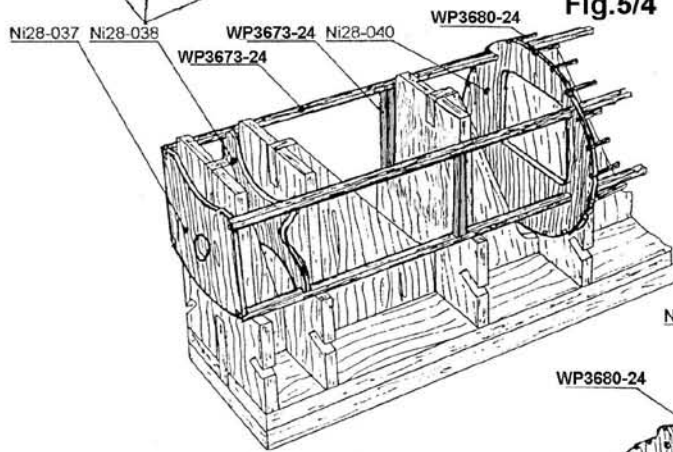


Fig.5/5

Fig.5/6

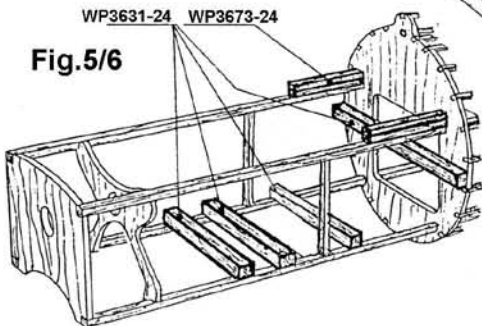
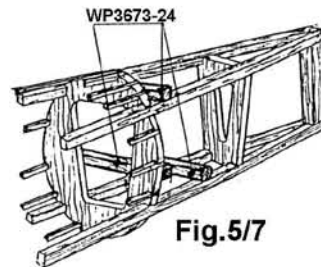
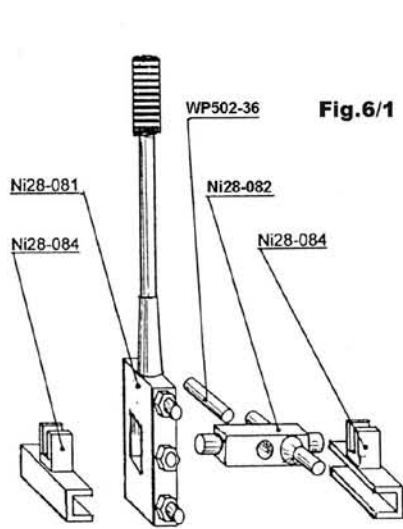
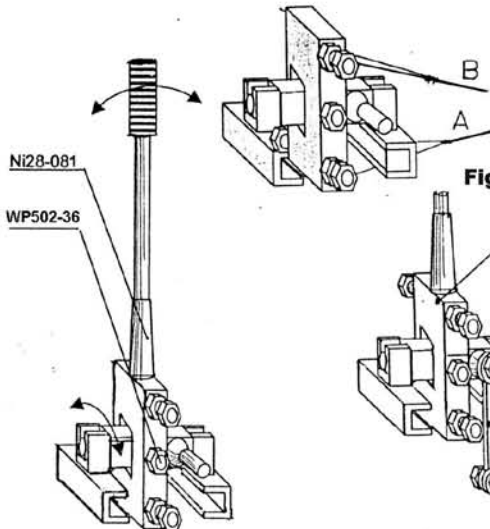


Fig.5/7

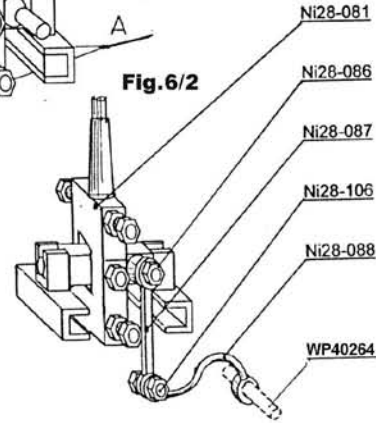




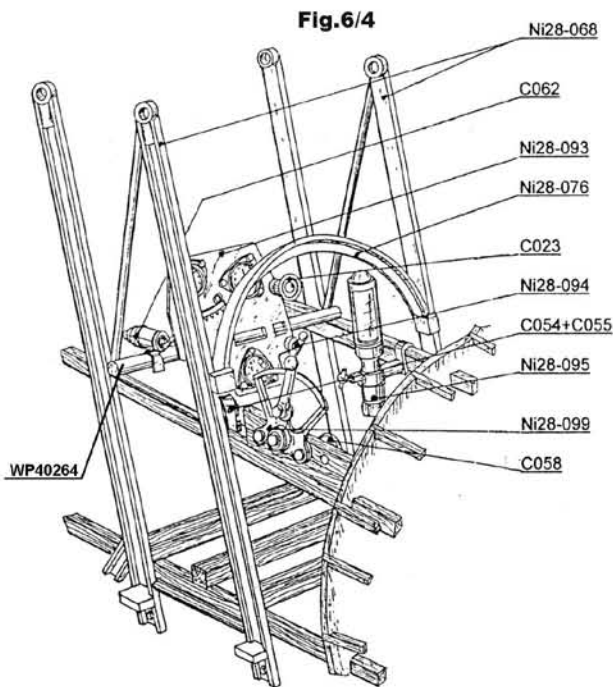
**Fig.6/1**



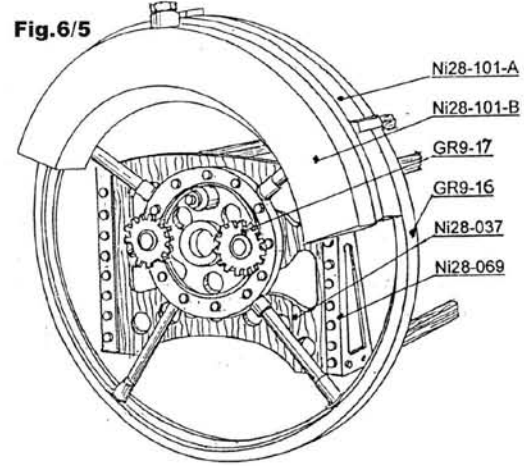
**Fig.6/2**



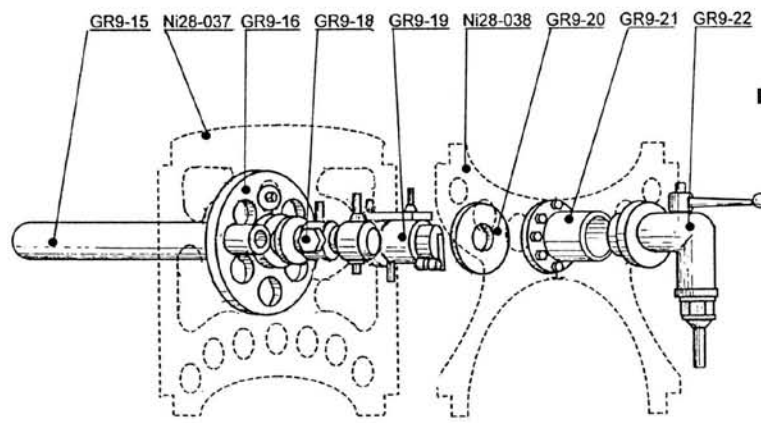
**Fig.6/3**



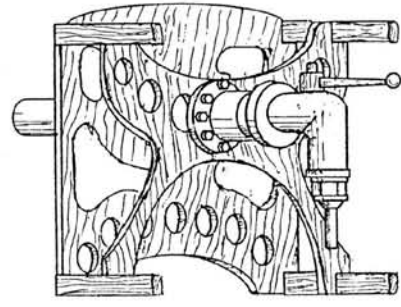
**Fig.6/4**



**Fig.6/5**



**Fig.6/6**



# Stage 6: Building the Cockpit and Controls

## PARTS LIST FOR STAGE 6:

Ni28-068	Cabane struts	2 R-L pair Britannia castings
Ni28-081	Control stick	1 Britannia casting
Ni28-082	Trunion	1 Britannia casting
WP161-12	Control stick pivot	1 3/64 x 1/2 Brass rod
Ni28-084	Control stick supports	2 Britannia castings
Ni28-086	False nuts	6 Britannia castings
Ni28-087	Aileron push levers	2 Britannia castings
Ni28-088	Aileron lever "S" arms	2 Britannia castings
Ni28-089	Rudder bar	1 Britannia casting
Ni28-090	Rudder bar support	1 Britannia casting
Ni28-091	Rudder cable yoke	1 Britannia casting
Ni28-092	Rudder control pin	1 2mm aluminum rivet
Ni28-093	Instrument panel	1 Britannia casting
WP40264	Instrument panel support bar	1 5/64 Brass rod
WP—	Instrument faces	1 Gloss paper - set of three
Ni28-094	Fuel handle	1 Britannia casting
Ni28-095	Fuel level	1 Britannia casting
WP1860	Rudder stirrups	2 1/4" aluminum tape
C023	Choke	1 Britannia casting
Ni28-101	Oil tank (2 parts)	2 Britannia castings
A017	Aileron control false bolts	2 Britannia castings
WP1205	Control cables A, B, C	6 Metal-gray thread
C062	Lubricator	1 Britannia casting
Ni28-099	Engine control quadrant	1 Britannia casting
C054	Starter magneto	1 Britannia casting
C055	Starter magneto handle	1 Britannia casting
C058	Magneto switch	1 Britannia casting
WP40224SEC	Cockpit plumbing	2' .031" Brass wire
GR9-15	Crankshaft	1 4x66mm Steel rod
GR9-16	Motor mounting ring	1 Britannia casting
GR9-17	Pump & magneto gears	2 Britannia castings
GR9-18	Oil pump	1 Britannia casting
GR9-19	Magneto	1 Britannia casting
GR9-20	Front crankshaft flange	1 Britannia casting
GR9-21	Rear crankshaft flange	1 Britannia casting
GR9-22	Air manifold & fuel pipe	1 Britannia casting
WP3680-24	Diagonal braces	2 3/64 x 3/64 wood strips
Ni28-069	Stiffening plates R-L pair	2 Britannia casting
Ni28-070	Stiffening plates	2 Britannia casting
Ni28-071	Cable brace plates	4 Britannia casting
Ni28-098	Seat back	1 Britannia casting
WP0978	Fuel tank straps	4 1/4" Copper tape
Ni28-100	Seat	1 Britannia casting
Ni28-105	Fuel filler pipe/caps	2 Britannia castings
Ni28-076	Arc strut brace	1 Britannia casting
Ni28-102a,b,c,d	Main fuel tank	1 Britannia casting (4 parts)
Ni28-103	Saddle fuel tank	1 Britannia casting
A037	Wire connections	1/4" lengths of copper spring
MODELER PROVIDES	Fuel tank skin	1 Sheet aluminum ñ SODA CAN
Ni28-???	Fuel tank strap buckles	4 Britannia castings
W042	Turnbuckles	12 Britannia metal
WP1205	Rigging cable	4' Metal-gray thread

### Control stick:

Referring to Figures 6/1 and 6/2, insert the trunion(Ni28-082) through the rectangular opening in the control stick(Ni28-081) and pin it in place with pivot (WP161-12). You will need to drill out the holes in the stick for the pivot pin and must cut the pin to length. Glue it's ends to the molded-on false nuts, making sure that the stick moves easily back and forth on the trunion.

In the actual aircraft, the joints between the control stick, push lever, and "S" arms are designed to move in two axes. This is accomplished in the model by the simple expedient of allowing sufficient free play in the linkage. It is suggested that you test fit the linkage before gluing on the false nuts, and then ream the holes in the push levers(Ni28-087) if needed.

Unite the aileron push levers(Ni28-087) and aileron "S" arms(Ni28-088) by means of the aileron control false bolts(A017) and false nuts (Ni28-086). Attach these assemblies to the trunion pivots and secure with false nuts. Make sure that all the joints move freely.

Glue the control stick supports(Ni28-084) into place on the 3x3mm braces(WPO3631-24) that run across the cockpit. The braces fit within the slots, which face each other, on the supports. Next insert the trunion pins into the brackets on the supports and gently crimp the brackets to secure the trunion pins but still allowing the control stick to pivot freely side to side.

Finish this step by attaching the 2 elevator control cables(WP1205) ("A" and "B" in Figure 6/2) to the control stick. Run the cables back through the fuselage, through the left outer of the bottom four lightening holes of formers #4-6, then through the left outer of the four holes in the brace across former #7. Temporarily tie them off at former #10.

### Rudder controls:

The rudder bar assembly consists of parts Ni28-089-092 and WP1860 as shown in Figure 6/3. Make sure the rudder bar(Ni28-089) swings freely. Make the stirrups from the 1/4" aluminum

tape(WP1860) by first folding the tape in half lengthwise, adhesive side in, then trimming to 3/16" wide. Mount the assembly onto the forward most 3x3mm wood brace, then attach the rudder control cables to the yoke(Ni28-091), pass them back through the fuselage, through the inner two of the bottom four lightening holes in formers #4-6, then through the inner two of the four holes in the brace across former #7. Temporarily tie them off at former #10.

**Engine fittings:**

Attach the metal stiffening plates(Ni28-069 and Ni28-070) to the first and second formers. Next glue on the cable brace plates(Ni28-071). Slip the pump and magneto gears(GR9-17) onto their shafts on the motor mounting ring(GR9-16). They are loose so they turn freely when the gear on the engine's distributor meshes between them. Temporarily affix them with tape to avoid losing them before you install the engine. Assemble the two parts of the oil tank(Ni28-101) as in Figure 6/5 and glue this to the motor mounting ring.

Paying attention to the order of the remaining engine accessory parts and location of the first and second formers (Figures 6/6 - 6/8) dry fit them with the

crankshaft and the engine mounting plate. Include the propeller and engine assemblies. When you are satisfied that everything properly lines up, remove the engine assembly and glue the flanges(GR9-20 and GR9-21) and the motor mounting ring to their respective formers. Glue the crankshaft into flange(GR9-21) and the air manifold and fuel pump(GR9-22).

Cabane struts; instrument panel; plumbing:

Referring to full-size Plan D03, locate the cabane struts(Ni28-068) and attach them to the longerons. Attach the arc strut brace(Ni28-076).

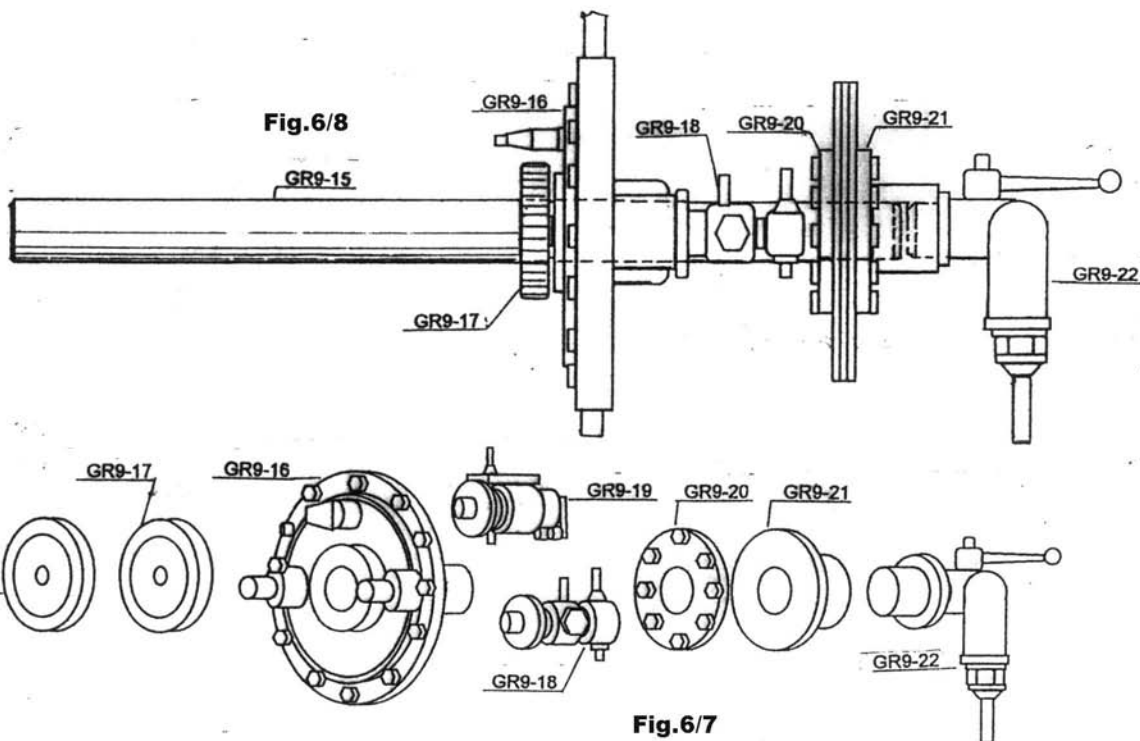
Separate the paper gauge faces(Ni28-???) by cutting away the black rectangle, then glue them to the back of the instrument panel(Ni28-093) and paint the back of the paper aluminum. Locate and install the instrument support bar(WP40264) at the back of the instrument panel, so it is visible through the rectangular hole in the panel. Glue the fuel handle(Ni28-094) to the hole in the instrument panel and the choke(C023) in the ring on the right hand edge of the panel. The lubricator(C062) attaches to the instrument support bar to the left of the panel.

Locate the engine control quadrant(Ni28-099) on the inside of the upper left longeron. Drill pilot holes for the mounting pins and glue it in place. Referring to Figure 6/4 and Plan D03, locate and install the starter magneto(Ni28-054) and its handle(Ni28-055), magneto switch (Ni28-058) to the inside surface of the upper right longeron; and the fuel level(Ni28-095) to inside surface of the right 5/64 x 5/64 brace.

Referring to Figure 6/12, connect the controls and gauges to their respective units by means of eleven lengths of .031" brass wire(WP40224SEC) inserted into 5mm lengths of copper spring(A037) to make the connections. These will fit over the pins molded into the castings. Take your time bending and test fitting this wire. Figure 6/12 is schematic. The actual plumbing runs should follow the Longerons. Leave enough extra wire for the two fuel lines when you attach the fuel tanks in the next step.

**Fuel tanks:**

Assemble the main fuel tank framework(Ni28-102a,b,c,d) according to Figure 6/9. Note that the side that would face the pilot leans inward, while the opposite side sits at a 90 degree angle.





Before skinning over the framework, it is important to file and sand off any rough spots and misalignments. Prepare the sheet aluminum skin by cutting apart an aluminum soda can and then pulling it, outer surface down, over a board or table edge to flatten it. Next, sand the painted surface with #200 grit paper to provide sufficient tooth for gluing. When finished, the inside of the can will be the outside of the fuel tank. The reason is it is easier to prepare the outer surface for gluing than the inner, varnished surface.

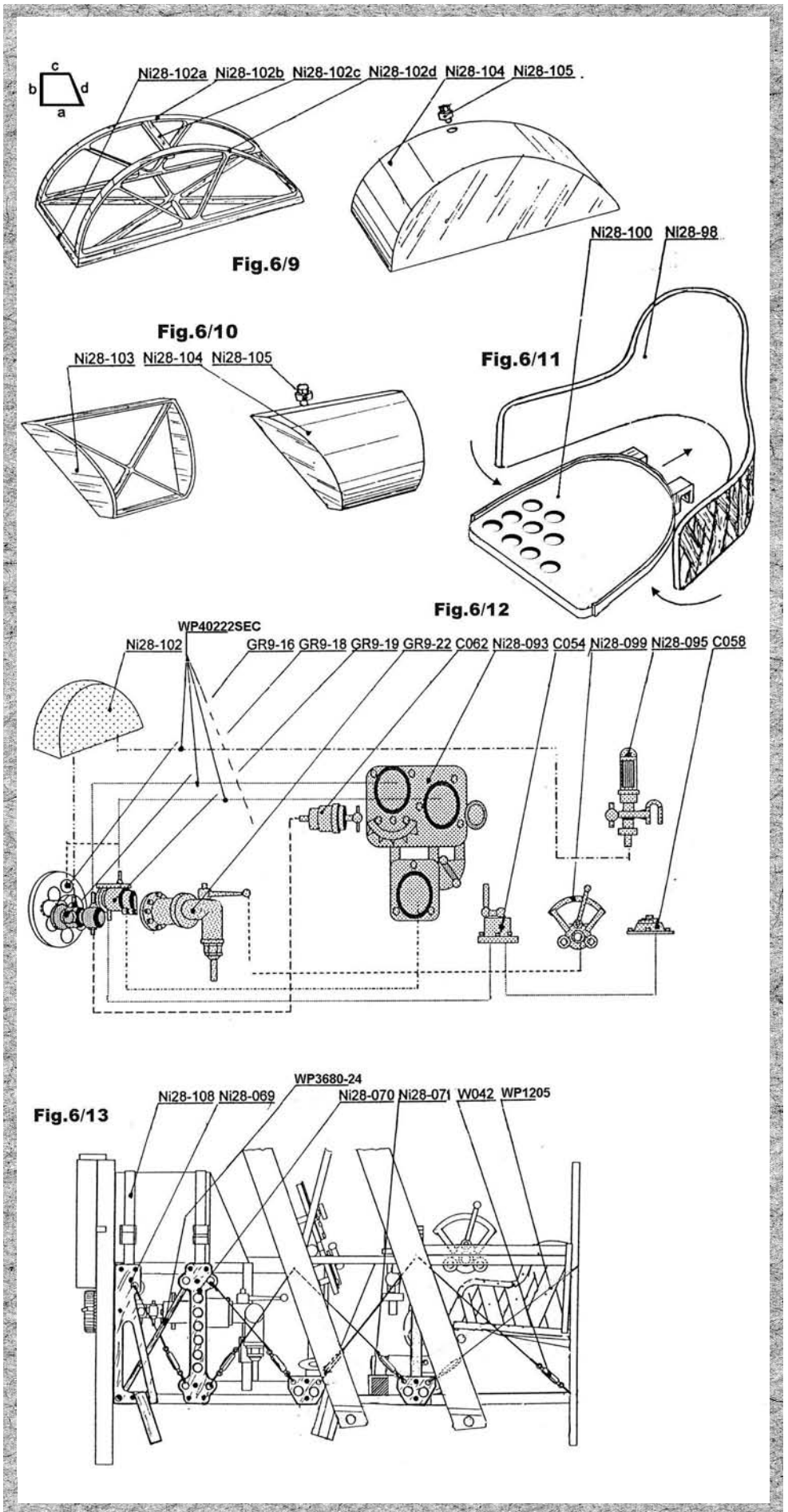
Start by Super Gluing a strip of aluminum over the arced portion of the main tank. Cut it as close as possible to the framework, then use a fine, flat mill bastard file to true the edge right to the frame. Repeat the process for the two sides, then finish up with the bottom. File from the outside toward the inside of the tank to avoid pushing the skin loose. The saddle tank(Ni28-103) is covered in the same way. After the tanks are covered, you can sand with #400 grit paper to get an even finish and then buff the tanks with steel wool. Finally, drill holes for the filler pipes(Ni28-105) and glue them in place. Referring to Figure 6/12 drill holes underneath the main fuel tank for the plumbing(WP40222SEC) (see previous step).

Glue the main fuel tank against the inside of former #1, across the upper longerons. The saddle fuel tank goes against the right longerons. In the real aircraft, the tanks were strapped into place. Make the tank straps(WP0978) out of 1/4" copper tape, folded in half lengthwise, adhesive side in, then trimmed to 3/16" wide. Wrap these around the tanks and longerons so that the straps appear to hold the fuel tanks in place, and slip on the buckles (Ni28-??). Refer to Figure 6/13 and full-size Plans D01 and D03.

**Rigging; seat:**

Referring to Figure 6/13, connect the bracing wires(WP1205) to the metal stiffenings(Ni28-069,070) and cable brace plates(Ni28-071), using twelve turnbuckles(W042).

Carefully bend the seat back(Ni28-098) and glue it to the seat(Ni28-100). Paint the seat back as described in the introduction, then glue the assembly onto the 1/8 x 1/8 horizontal brace attached to fuselage former #4. Refer to Figure 5/6.



# Stage 7: Landing Gear, Guns, Empennage Assembly

## PARTS LIST FOR STAGE 7:

Ni28-072	Landing gear struts	2	Britannia castings
Ni28-073	Tires	2	Rubber
Ni28-074	Wheels	4	Britannia Castings
Ni28-075	Wheel locks	2	Britannia castings
Ni28-078	Wheel hubs	2	Britannia castings
WP1227	Shock cord	4	Tan nylon cord
Ni28-080	Axel	1	Britannia casting
Ni28-077	Tailskid	1	Britannia casting
Ni28-109	Gun barrels/ cooling jackets	2	Britannia castings
Ni28-110	Gun breech assemblies	2	Britannia castings
C017	Gun barrel caps	2	Britannia castings
C018	Muzzle flame arresters	2	Britannia castings
Ni28-112	Machinegun mounts	2	Britannia castings
Ni28-111	Gun mount braces	3	Britannia castings
WP3680-24	Stabilizer struts	2	3/64 x 3/64 wood strips
W042	Turnbuckles	2	Britannia castings
WP1205	Rigging cables	2'	Metal-gray thread
J020-023	Fuselage support stand	4	laser-cut wood parts 5/32 thick

### Landing gear:

Assemble the wheels using two parts(Ni28-074) and one hub (Ni28-078) each. These "solid" wheels were actually fabric grass guards stretched over wire spoke wheels, therefore you might want to paint these a canvas color. Stretch the tires and snap them onto the wheels. Locate the tailskid(Ni28-077) on Plan D03 and glue it into place.

Return the fuselage to the support stand you previously constructed. Slide the landing gear struts(Ni28-072) onto the axel(Ni28-080) and, referring to Figure 7/1, attach the rear landing gear struts to the junction of the inside interplane struts and the stringers. Tie the shock cords(WP1227) in place, then mount the wheels and secure them with the wheel locks(Ni28-075). Attach the crossed cable braces(WP1205) using turnbuckles(W042), according to Figure 7/1, then attach the third cable brace from the center of the axel to the point where the other two braces cross. Refer to Plan D01.

### Machine guns:

The gun barrel caps(C017) included with your model represent Colt-Vickers machineguns. To improve the look of your model, drill out all the dimples on the gun barrel caps and the muzzle of the flame arresters(C018). Assemble the four parts(Ni28-109, 110 and C017, 18) of each machine gun, noting that the muzzle/flame arresters attach below the center of the cooling jackets. The two guns are mounted left of the main axis of the fuselage.

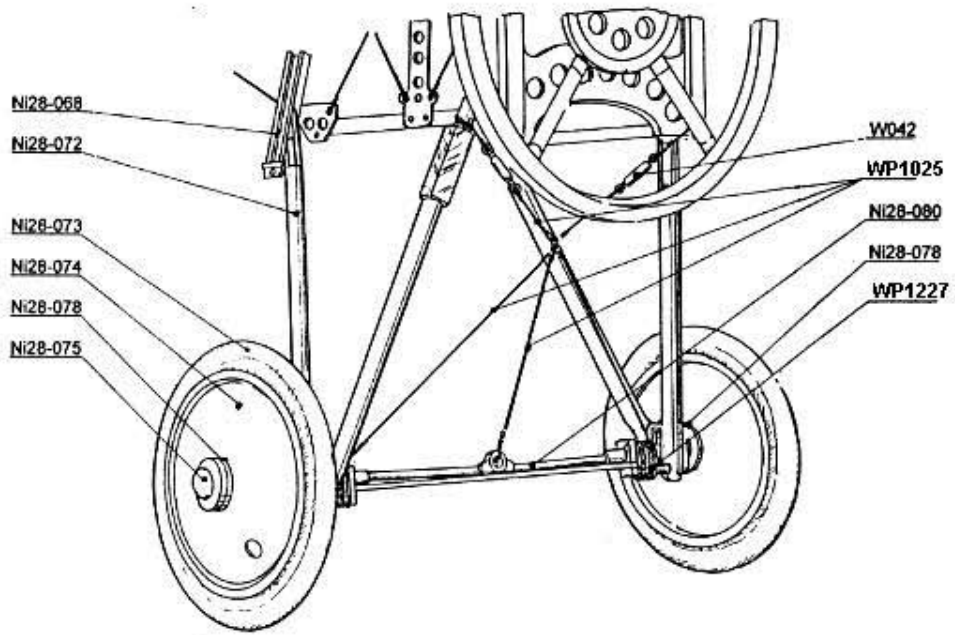
Referring to Figures 7/2 and 7/3, glue the machine gun mounts(Ni28-112) to the left cabane struts and then connect them with the three mount braces(Ni28-111). You might want to paint the two guns before gluing them onto the mounts.

### Empennage assembly:

Glue the vertical fin you previously assembled between the fin braces (2/64 x 5/64 wood strips ñ WP3673-24) on the stabilizer. Check that the fin/rudder assembly is at a right angle to the stabilizer and make sure that the rudder and elevator move freely. Then, attach the bracing cables(WP1205), being especially careful not to pull them so tight you create a dihedral to the stabilizer.

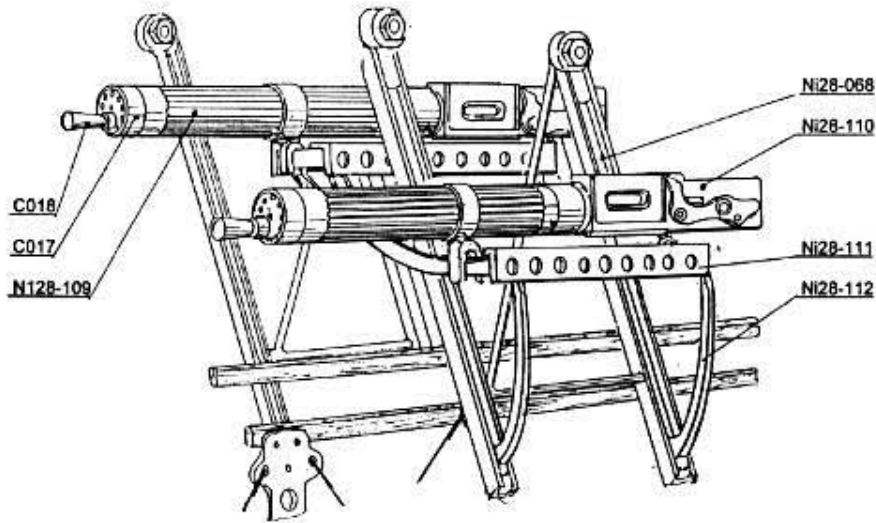
Set the airplane on a level surface, then glue on the empennage so that the leading edge of the fin rests between fuselage formers #9 and #10. Check to make sure the fin/rudder is perpendicular to the surface and that the axis of the stabilizer is at a right angle to the long axis of the fuselage. After the glue has dried, make the stabilizer struts from 3/64 x 3/64 wood strip(WP3680-24) and glue them in place according to Figures 7/4 and 8/6.

**Fig.7/1**

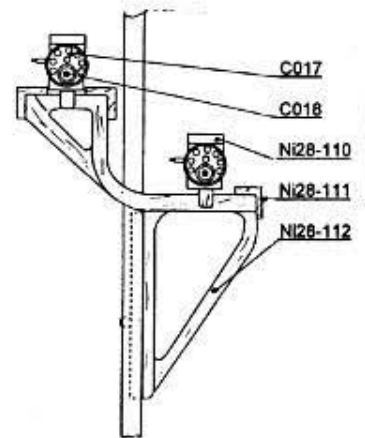


**Fig.7/2**

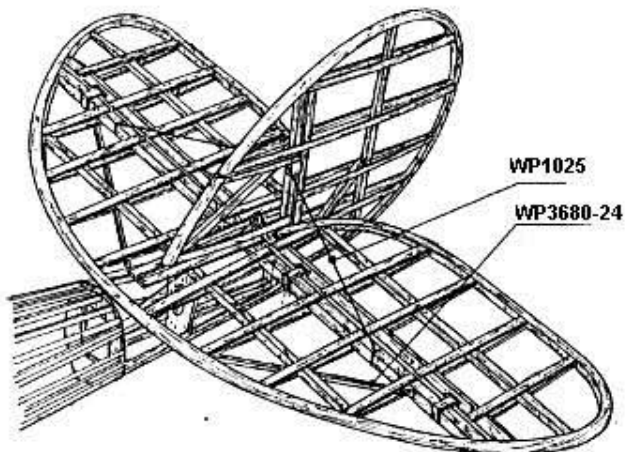
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**Fig.7/3**



**Fig.7/4**



# Stage 8: Final Assembly

## PARTS LIST FOR STAGE 8:

Ni28-035	End fittings for interplane struts	8	Britannia castings
WP3629-24	Interplane struts	4	3/32 x 1/4 basswood
W042	Turnbuckles	12	Britannia castings
WP1205	Interplane bracing wire	7'	Metal-gray thread
A017	False bolts	12	Britannia castings

### Rudder and elevator control cables:

Temporarily brace the control stick in the neutral position, perpendicular to the plane of the cockpit floor. Temporarily brace the rudder bar at a right angle to the axis of the fuselage. Untie the rudder control cables, which you had previously tied out of the way at fuselage former #10. Cross them so the right cable goes to the left rudder control horn and the left one to the right rudder control horn. Tie and glue them in place, referring to full-size Plan D03. The cables should be snug but not too tight. In similar fashion, cross the elevator control cables so "B," the upper one on the control stick, goes to the lower elevator horn and "A" goes to the upper control horn. When you release the control column and the rudder bar, these controls will activate their respective control surfaces just like in the real aircraft. It is recommended, however, that you do not operate the controls. The scale parts are delicate and might easily break.

### Lower wing and ailerons:

Without applying glue, insert the aileron torque bars(A022) through the holes in the aileron lever "S" arms(Ni28-088), then glue the lower wing in place. Make sure to glue the joints between the cabane struts and the wing spars.

Brace the control column in the neutral position and make sure the ailerons have zero deflection. Now glue the "S" arms to the aileron torque bars. When the glue is dry, moving the control column side to sides should actuate the ailerons. As above, it is recommended that you do not operate the controls. The scale parts are delicate and might easily break.

### Upper wing:

For the upper wing to line up properly, it is critical that the assembled interplane struts be of equal length and that they match their depiction on Plan D01. Working directly from Plan D01, cut four slightly oversize lengths of wood strip WP3629-24 and then sand them to exactly the same, correct length. Cut a slot in each end, following the longer of the two dimensions, then prep the cut ends with a little water-thin CA glue. When this has set up, glue on the end fittings (Ni28-035). Complete the assembly by shaping the wood to the same tear drop cross-section as the end fittings. The broader curve will face forward when the interplane struts are installed. You might wish to stain these struts gold-mahogany and finish them with a couple coats of varnish or shellac.

The cabane struts attach to the compression bars(Ni28-018) by means of false bolts(A017). The mounting holes are slightly oversize to allow for correct positioning of the upper wing. Essentially the same method is used to attach the interplane struts to the compression bars. Once you are satisfied that the fit and angles are correct, glue both the contact points of the all of the struts and the compression bars and the insertions of the false bolts.

### Struts cross bracing:

Referring to Figure 8/6, use turnbuckles(W042), at the lower end of each run, and Metal-gray thread(WP1205) to rig the cross bracing. Note that the braces from the top of the interplane struts to the bottom of the cabane struts are doubled. Make sure the braces are snug, but do not over-tighten them. Finally, rig the right and left wire braces between the stabilizer and the fin.

### Finishing Touches:

Slip the combined propeller and motor sub-assembly onto the crankshaft, allowing it to turn freely. Check the entire model over to ensure all glue joints are tight. Carefully clean any previously unnoticed excess glue beads and touch up the stain and paint if needed.

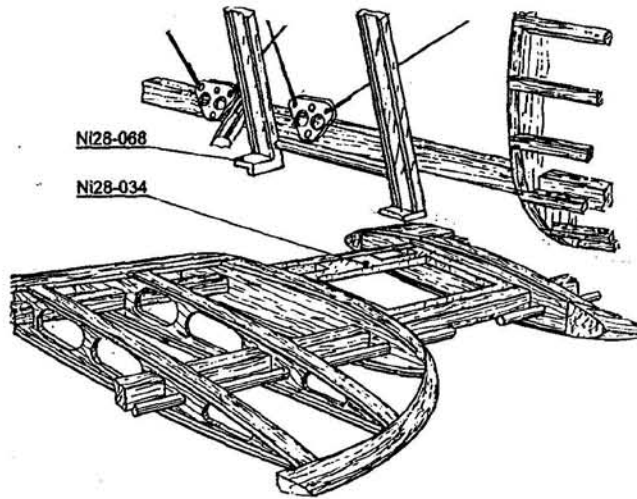
Congratulations - your NIEUPORT 28 is finished! Stand back and take a picture. We at Model Airways and Model Expo hope you have enjoyed this project and look forward to flying with you on your next aircraft modeling project. As this is a delicate model, we suggested that you mount it on a suitable baseboard and cover it with a protective glass or acrylic display case.

### Bibliography:

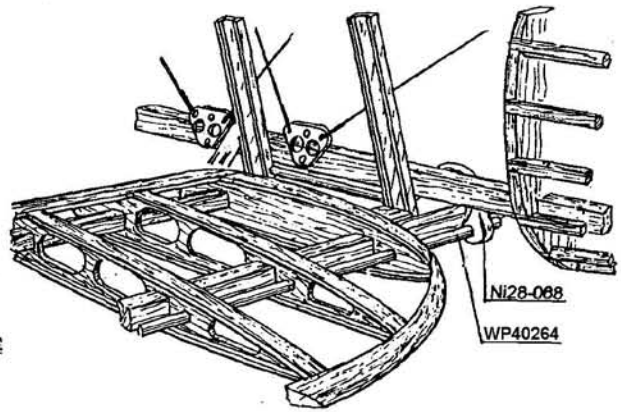
1. Smithsonian Institution, National Air and Space Museum, Archives Division, Washington, D.C.
2. Nieuport Fighters in Action, Aircraft Number 167, by Peter Cooksley. Squadron/Signal Publications. Carrollton, TX. 1997. One of a popular series of books published by the Squadron mail order firm that sells plastic and other model kits from all over the world. This one is about all the Nieuport aircraft from Model 10 through 28. Many, many photos and descriptions.
3. French Aircraft of the First World War, by Dr. James Davilla and Arthur Soltan. Flying Machines Press, Stratford, CT. 1997. Aircraft drawings and photographs of the French aircraft used during the war.

**LOWER WING/FUSELAGE ASSEMBLY  
REAR VIEW**

**Fig. 8/1**

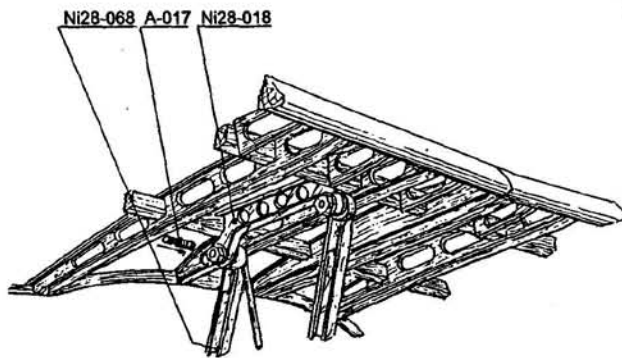


**Fig. 8/2**



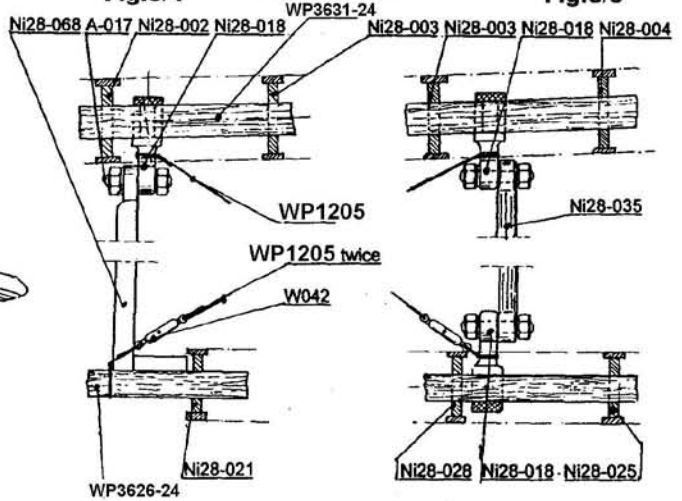
**UPPER WING/FUSELAGE ASSEMBLY  
FRONT VIEW**

**Fig. 8/3**



**Fig. 8/4**

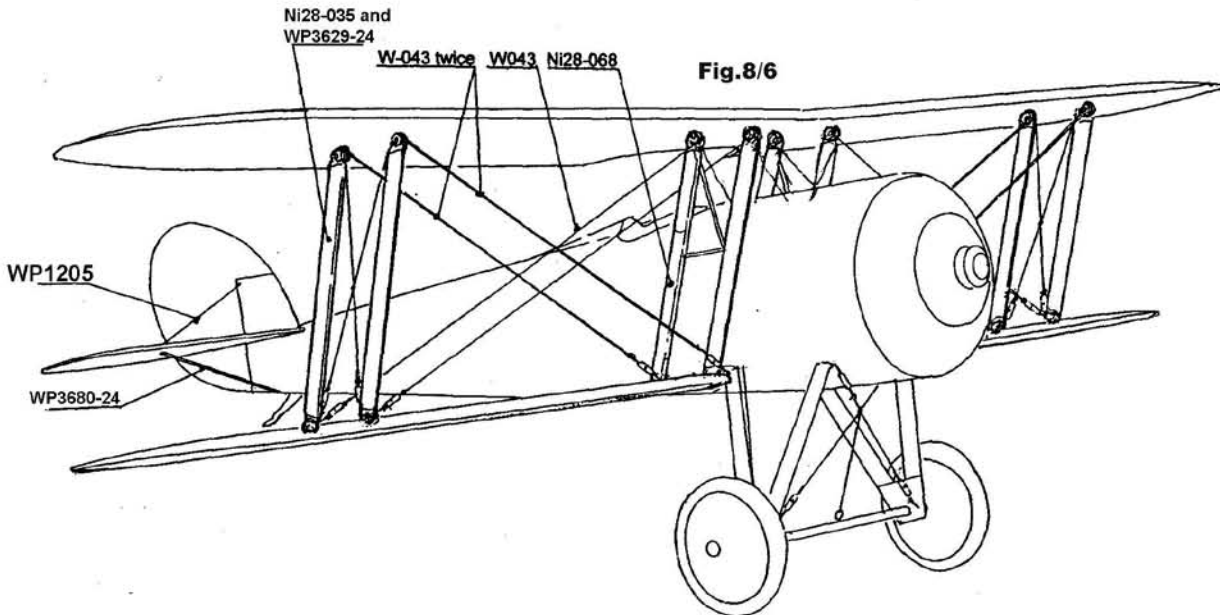
**NOT IN SCALE**



**Fig. 8/5**

Ni28-035 and  
WP3629-24  
W-043 twice W043 Ni28-068

**Fig. 8/6**



4. Jane's Fighting Aircraft of World War I, forwarded by John W.R. Taylor. Military Press, New York. 1990. Photos and description of NIEUPORT 28 and other WWI aircraft, and plans and photos of the Gnome-Rhone engine.

5. WW I Aero - The Journal of the Early Airplane. A quarterly journal published by Leonard E. Opdycke, Poughkeepsie, NY. Many issues of this journal have articles about the NIEUPORT, with photos.

6. World Encyclopedia of Aero Engines, by Bill Gunston. Patrick Stevens Limited, Sparkford, England. 1996. Contains a history of the Gnome and Gnome-Rhone engine company.

7. Many historical notes and specifications of the NIEUPORT 28 can be found on the World Wide Web. Search the name NIEUPORT.

