

# LITTLE DIPPER

**A unique competitive sport scale model of a little known aircraft with a distinctive personality.**

**T**he Little Dipper was without doubt one of the most interesting and inspired light airplanes ever built. It was also Lockheed's smallest and least publicized product and it never got beyond the prototype stage. The design concept was unparalleled in its simplicity, performance was remarkable and, above all, it was thoroughly safe and easy to fly.

John W. Thorp was the Assistant Chief of Preliminary Design at Lockheed's Vega Division in 1944 and had been conducting some design studies on a small two place aircraft on his own time. His boss, Mac Short, was impressed with John's design and presented it to Lockheed's President, the late Robert Gross.

Gross gave Short his blessing and the Dipper project was formed in the Vega Division in June 1944, with Thorp in charge. The group, which included five designer-draftsmen and five experimental mechanics, immediately set up shop and began constructing the prototype Little Dipper Model 33 (Vega V-304) and a four place pusher companion model called the Big Dipper. Progress moved at a rapid pace and in about three months' time the first machine, NX18935, was ready to fly.

An ideal engine was not available for the Little Dipper but engineers worked out a deal with Air-Cooled Motors whereby two cylinders from a Franklin engine would be mounted on a special crankcase. The resulting two cylinder, 50 hp Franklin turned out to be almost ideal.

Vega's chief test pilot, Bud Martin, flew the Little Dipper for the first time during the last week of September 1944. The event took place without incident at the old CAA emergency field near Newhall, California. A few days later the Little Dipper took to the air again, this time in the hands of the famous Milo Burcham, former Lockheed chief of flight testing. The tiny plane was a complete success, giving all that was expected of it and more.

**By Dick Tichenor**

In spite of the fact that he was not an official test pilot, John Thorp did much of the initial flying. The Little Dipper, which was a direct development of his original two-place design, was his baby and he was anxious to prove the airplane's worth and versatility. Thorp never missed an opportunity to demonstrate its amazing maneuverability and short-field performance. He could and often did take off, fly around for fifteen minutes, or until he got dizzy, and land the airplane — all within a 300 ft. circle! Its turning radius was so short that it could almost pivot on a wing tip.

Following the crash of the prototype Big Dipper in the spring of 1946, the entire project was written off the books. The Little Dipper was then placed in dead storage along with a second partially completed example. In spite of several sincere efforts to save the airplanes, the Little Dippers were subsequently broken up for tax purposes a few months later.

This writer has been fascinated by the Little Dipper for more years than he will admit but has been deterred from building a model because of the huge canopy requirement which is a vital part of the Dipper's personality. The introduction of the Saito FA-90T four stroke two cylinder engine brought an end to the procrastination. The dimensions of the Saito FA-90T are very close to one quarter size of the two cylinder Franklin engine used in the Dipper. Since the original Little Dipper had a wingspan of only 25 feet, a Quarter Scale version has proven to be an excellent combination.

Our enthusiasm for this project during construction was exceeded only by the flight performance. We know that everyone raves about how well his latest pride and joy bores holes in the sky to a point of causing disbelief. Hang on, here it comes again. This bird flies like the original, the combination of ample power and light wing loading with wing flaps provide a remarkable speed range with safety. Horizontal flight at full throttle results in a quite respectable speed; a landing approach with full flaps, nose a bit high, engine with a touch of throttle gives a walk-along touchdown speed. Loops from horizontal at 3/4 throttle are no sweat, inverted flight with full flaps looks dumb but the airplane doesn't mind.

## LOCKHEED LITTLE DIPPER

Designed By:

Dick Tichenor

**TYPE AIRCRAFT**

Sport Scale

**WINGSPAN**

75 Inches

**WING CHORD**

13 Inches

**TOTAL WING AREA**

970 Sq. In.

**WING LOCATION**

Mid-Wing

**AIRFOIL**

Flat Bottom

**WING PLANFORM**

Constant Chord

**DIHEDRAL EACH TIP**

3% Inches

**O.A. FUSELAGE LENGTH**

48 3/4 Inches

**RADIO COMPARTMENT SIZE**

(L) 13" x (W) 5 1/4" x (H) 2 1/2"

**STABILIZER SPAN**

28 Inches

**STABILIZER CHORD (incl. elev.)**

8 Inches

**STABILIZER AREA**

220 Sq. In.

**STAB. AIRFOIL SECTION**

Symmetrical

**STABILIZER LOCATION**

Top of Fuselage

**VERTICAL FIN HEIGHT**

11 1/2 Inches

**VERTICAL FIN WIDTH (incl. rud.)**

9 1/2" (Avg.)

**REC. ENGINE SIZE**

.90 (4 stroke), .60 (2 stroke)

**FUEL TANK SIZE**

8 Oz.

**LANDING GEAR**

Tricycle

**REC. NO. OF CHANNELS**

5

**CONTROL FUNCTIONS**

Rud., Elev., Throt., Ail., Flap

**BASIC MATERIALS USED IN CONSTRUCTION**

Fuselage ..... Balsa & Ply

Wing ..... Balsa & Ply

Empennage ..... Balsa

Wt. Ready To Fly ..... 168 Oz.

Wing Loading ..... 24.9 Oz./Sq. Ft.

## LITTLE DIPPER Scale Documentation

**Meets AMA Scale  
Contest Requirements**

*with order for Plan #915  
add \$1.00*

**Documentation Package  
separately \$2.50 p.p.**

*Calif. res. add 6% sales tax*



Horizontal Figure 8's while rolling to the outside only require some smart thumbs on the transmitter as the Dipper does what ever you tell it to do. This maneuver will amaze your friends who will remark, "I don't believe it, do it again!"

We prefer to barnstorm but the Little Dipper does fairly well in competition. Within 30 days from the first test flight it had brought home a first place and two second place trophies. It picked up a static judging score of 92 points at the 1983 Western Scale Championships. Somehow it makes this construction article a bit easier to put together and we have stopped calling it Tichenor's Little Toad.

This might be an appropriate place for a confession along the lines of "don't do as I do, do as I say." When we reached the point to quit tinkering and see if this project is going to fly we simply packed our gear and headed for Mile Square. Of course, this was a brand new unflown airplane. Also, the Saito FA-90T engine had never been fired up. Further, the Hobby Shack Cirrus 900 XLC 7 channel radio had never been flown, like out of the box and installed in the Dipper. You might refer to this approach as going for broke.

After the aircraft was assembled we went through a satisfactory range check and all the controls worked in the proper directions. After pumping fuel into the tank came the moment of truth with the engine. Guess at a needle setting, choke a couple of turns,

hook up battery, and flip the prop. That Saito came to life! A bit of tweeking on the needles, no sag in rpm with the nose held straight up, and an agreed "let's do it." Sometimes you just plain luck out, everything worked beautifully from the very beginning and has been the most trouble-free airplane that we've ever had. What can you say about a Cirrus radio that has performed flawlessly hour after hour? No complaints whatsoever, it is great and at the Hobby Shack price you can't find a better value.

We can't say enough good words about the Saito FA-90T four stroke engine. Powerful, excellent idle, reliable, quiet, easy to start, and a beautiful piece of machinery. It has one characteristic that you learn real fast, it doesn't like to be choked very much. Over-choke it and it will bite

**Little Dipper Partial Kit**  
available from  
**P & W Model Service,**  
1114-B E. Edna Place,  
Covina, California 91724.

Partial Kit contains: fiberglass cowl, fiberglass headrest, butyrate canopy, 3/16" dia. formed main landing gear, fuselage formers (ply & balsa), and machine cut ribs for wing, stab and fin.

**Complete Package \$56.00 p.p.**  
**in Continental USA.**

Foreign countries write for prices. Allow 4-6 weeks for delivery. California residents add 6% sales tax.





you and that smarts so don't do it. Even our conservative Clarence Lee has heaped enthusiastic praise on the Saito FA-90T twin.

As for the airplane, not only has it performed exceptionally well but it has a personality all of its own. It is refreshingly different from the rest of the models and we really enjoy the compliments from those who examine it on the ground and watch it in the air.

Since we are not recommending this project as the first R/C airplane for a beginner we will not go into the glue part A to part B routine. The drawings and photos are pretty much self-explanatory and there really isn't

anything unusual or difficult. Also, there are a couple of discrepancies between the photos and the plans, in such cases we have found a better way after building the model so give the plans precedence over the photos. Further, if you have your own favorite construction methods, have at it, we just did the things that were the easiest for us.

#### CONSTRUCTION

This was our first exercise in building an entire model using only cyanoacrylate adhesives. There is one exception that we will explain a little later. For this project we selected the Pacer line of products, primarily the Zap/CA, CA + Zap-A-Gap, Kicker,

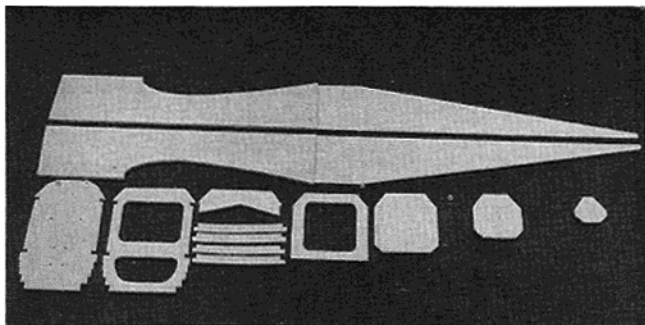
and a bit of Slo Zap CA-. Our reference will simply be Zap or CA. To be straightforward about this subject, we haven't really felt comfortable in using CA in some applications; it is difficult to break some old habits. The Little Dipper has lead a rigorous life, is still as good as new and we are now totally oriented toward CA. Not really as good as new, big Joe Zdankiewicz has just about worn out the tires with his spectacular landings while using the wheel brakes.

#### Fuselage:

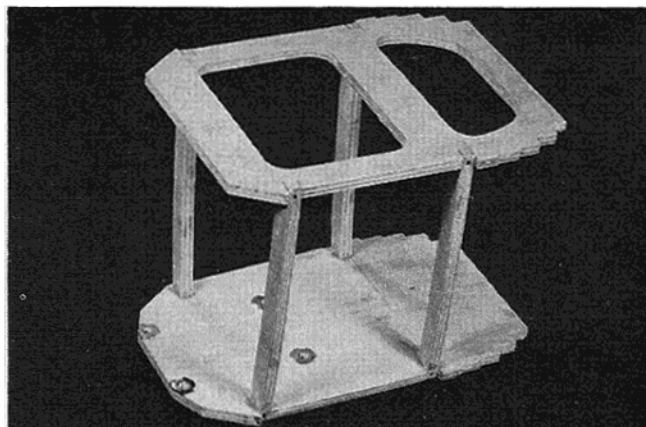
As usual we cut out the basic fuselage parts and in this case the first assembly is the 1/4" ply parts F-1, F-2,

*The original Lockheed Little Dipper in its final configuration. Only one example was built and it was destroyed for tax write-off benefits.*

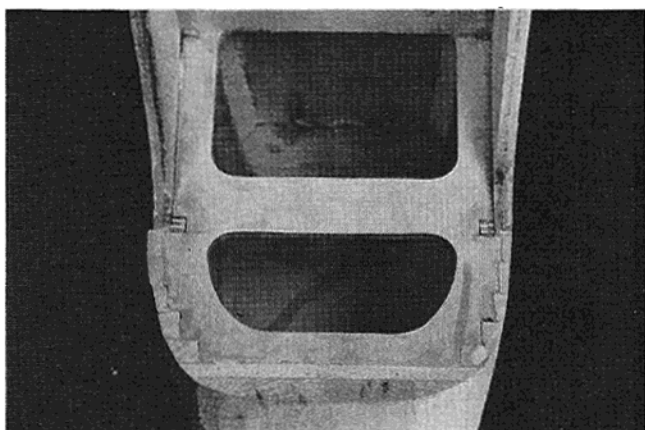




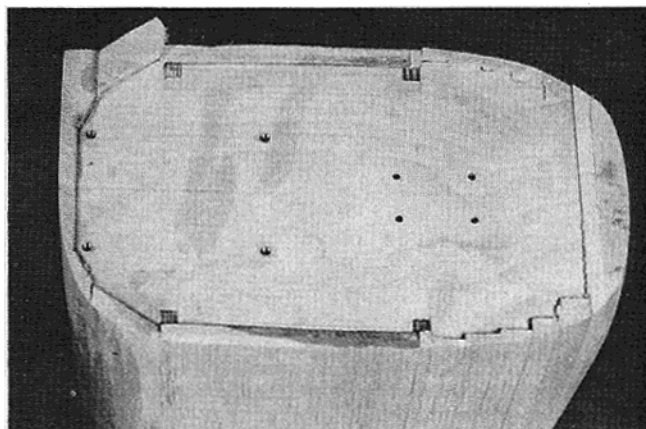
Parts required to start fuselage assembly.



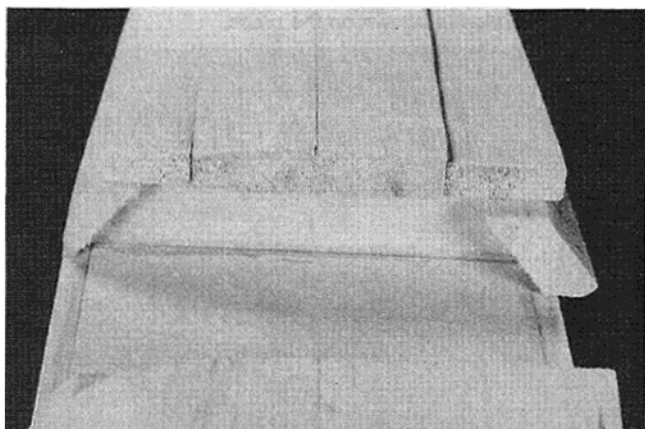
These parts were assembled with 45 minute epoxy. Note small nails to hold while epoxy sets. Proper alignment is critical.



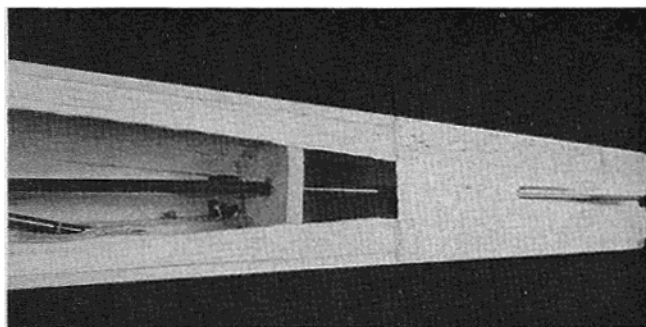
Compound curves in nose section is obtained by shaping strips and sheets as shown.



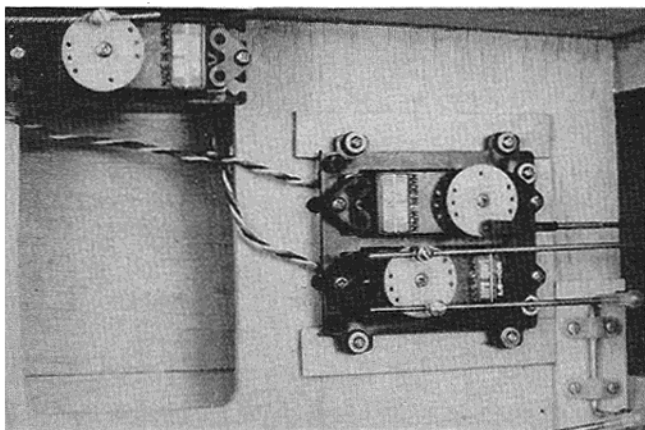
This is how the shape came together at the firewall. Note top sheet is recessed to clear engine mount nut plates.



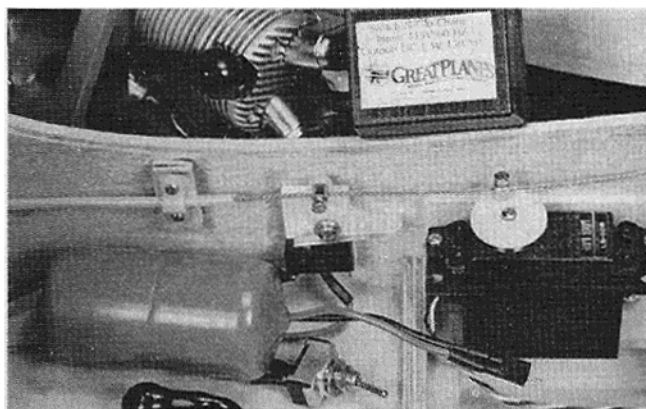
Top aft sheeting at cockpit area.



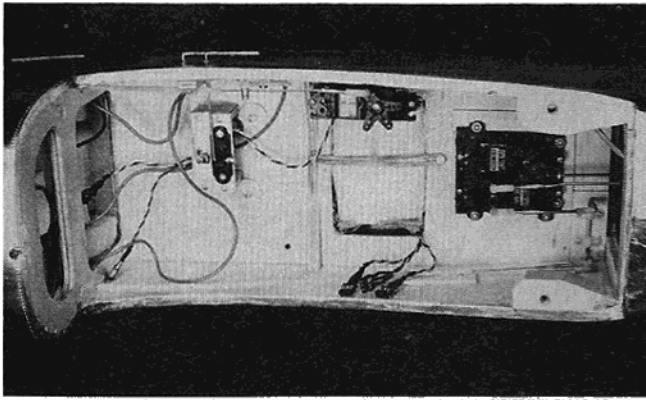
Rigid Gold 'N-Rod' pushrods were installed in fuselage prior to attaching bottom aft sheeting.



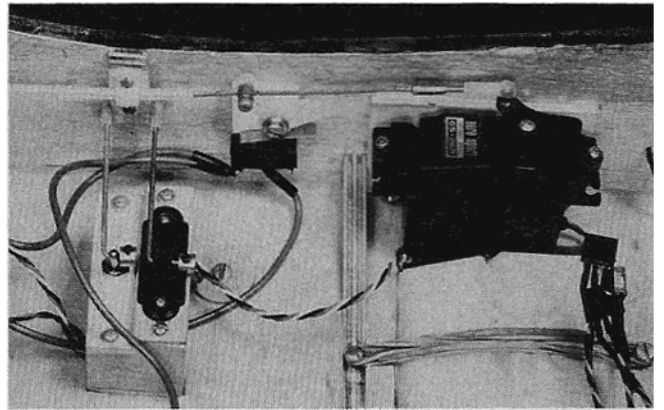
Rudder and elevator servo installation. Nose steering rocker is shown in lower right corner of photo.



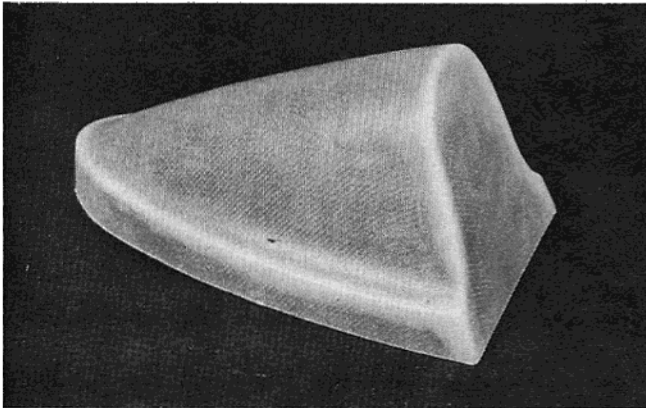
A Great Planes' Switch-N-Glow twin harness on-board ignition system was used with the Saito FA-90T 2 cylinder 4-stroke engine. The micro switch is shown installed, other components shown for info only.



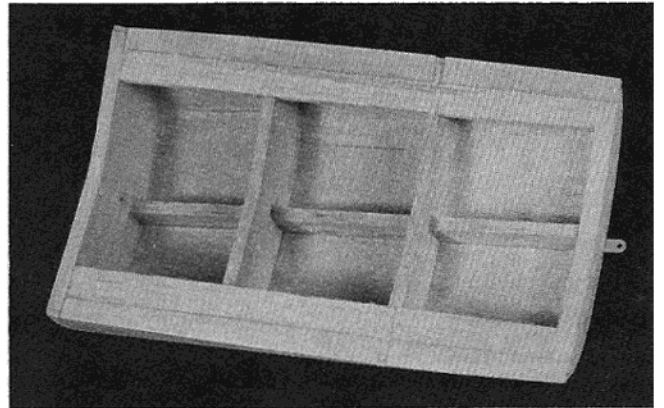
General view of fuselage radio installation. Foam wrapped receiver is located in center opening. A Hobby Shack Cirrus 900-XLC 7 channel radio was used.



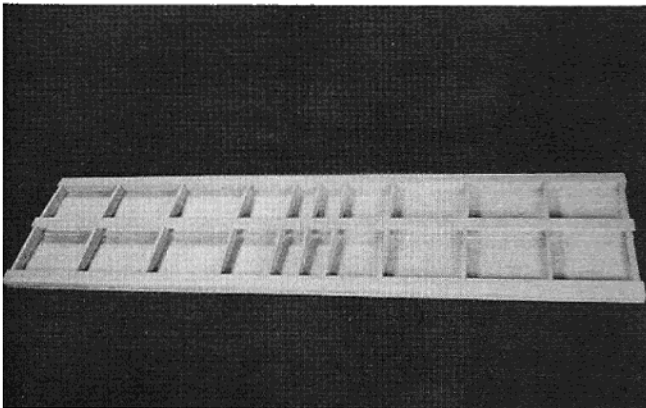
Details of ignition switch (on left) and receiver switch installation. Throttle servo uses an alleron type mount.



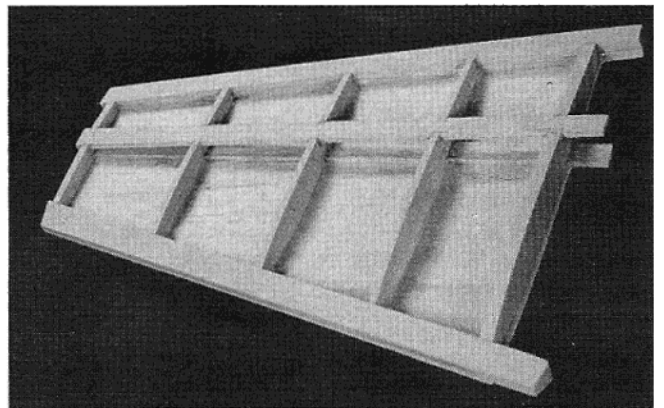
A fiberglass headrest was made after encountering difficulties in fitting a carved balsa part.



The original belly pan is shown here for structural details. An improved version is shown on the plans.



Horizontal stab structure prior to installing top skin.



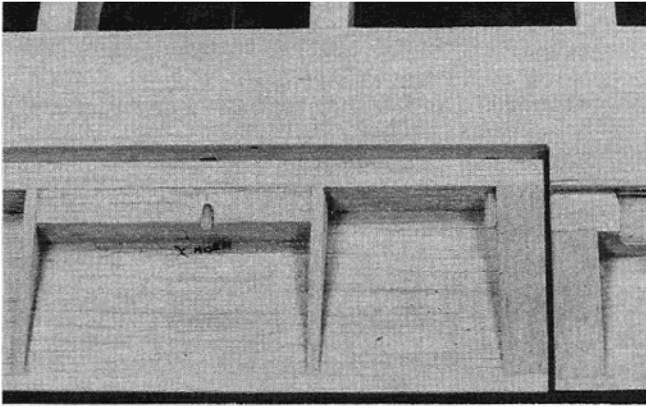
Vertical stab prior to attaching left skin.



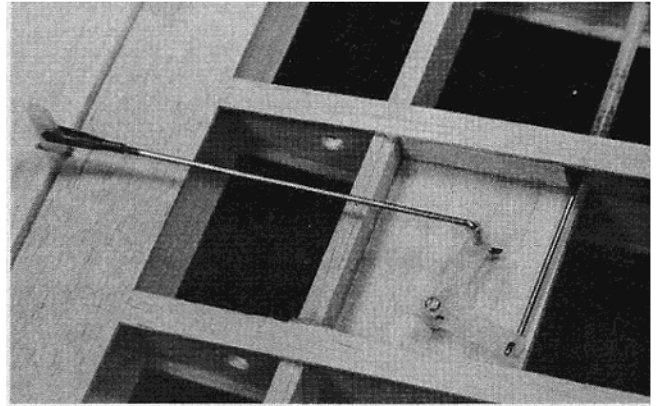
Inboard wing panel in early assembly stage. Note dihedral gauge for center rib.



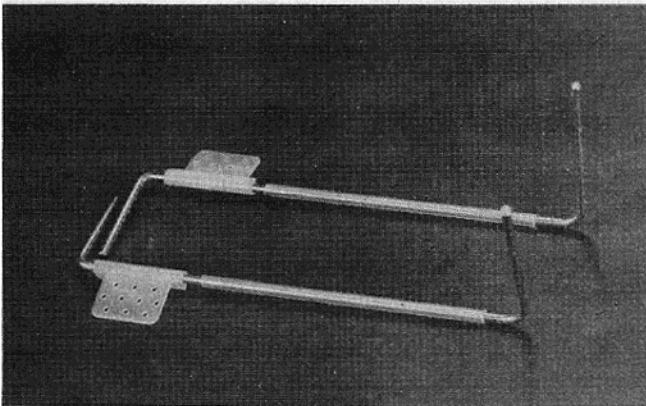
A larger view of wing assembly.



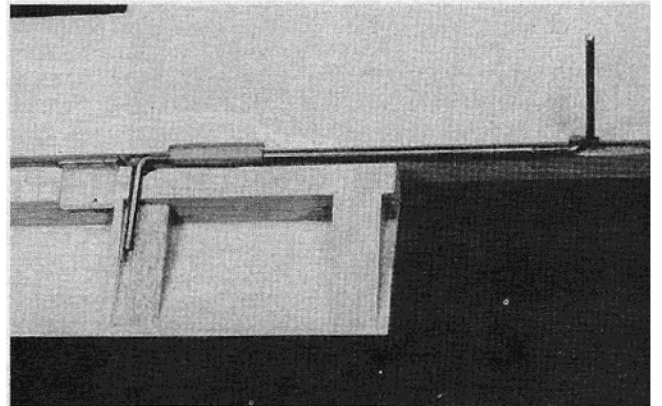
*Aileron structure at inboard end.*



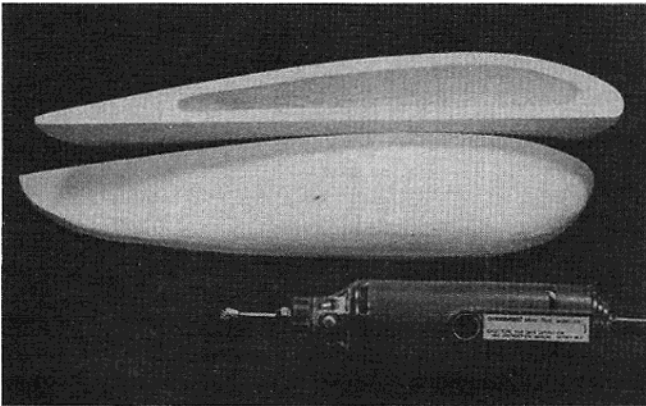
*Aileron control installation.*



*Flap control details.*



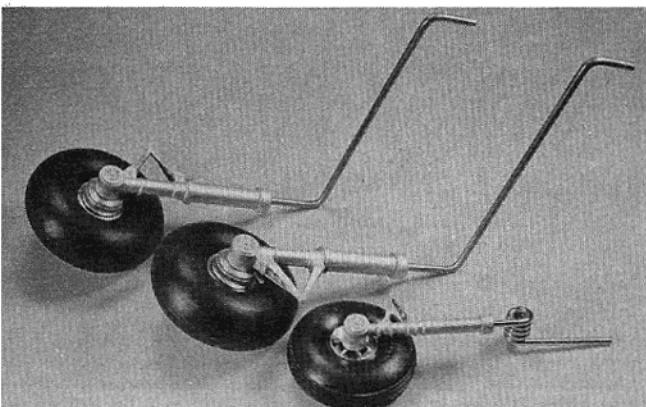
*Flap control installation at inboard end of unfinished flap.*



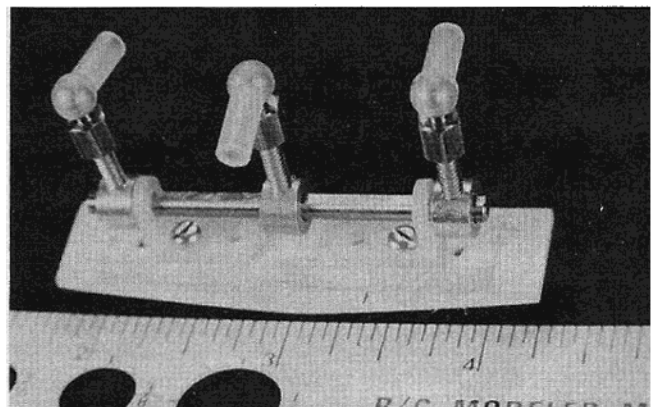
*Rough shaped and hollowed wing tips.*



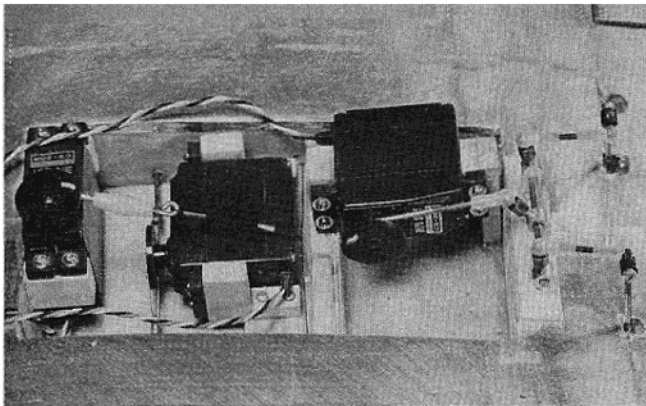
*License numbers were cut from red MonoKote. Masking tape was used for location and alignment of numbers.*



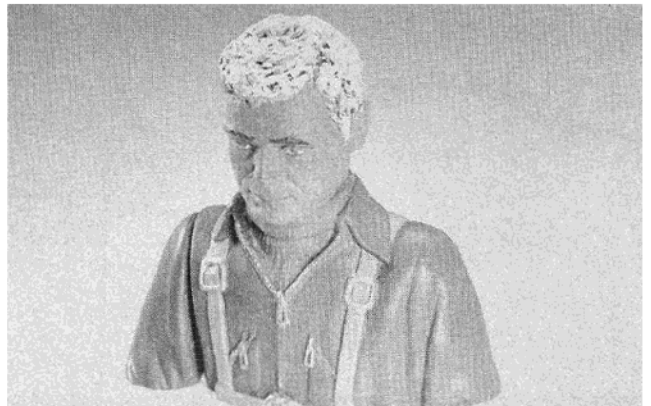
*Robart scale struts were installed over the wire struts and streamline fairings were later added to the main gear struts.*



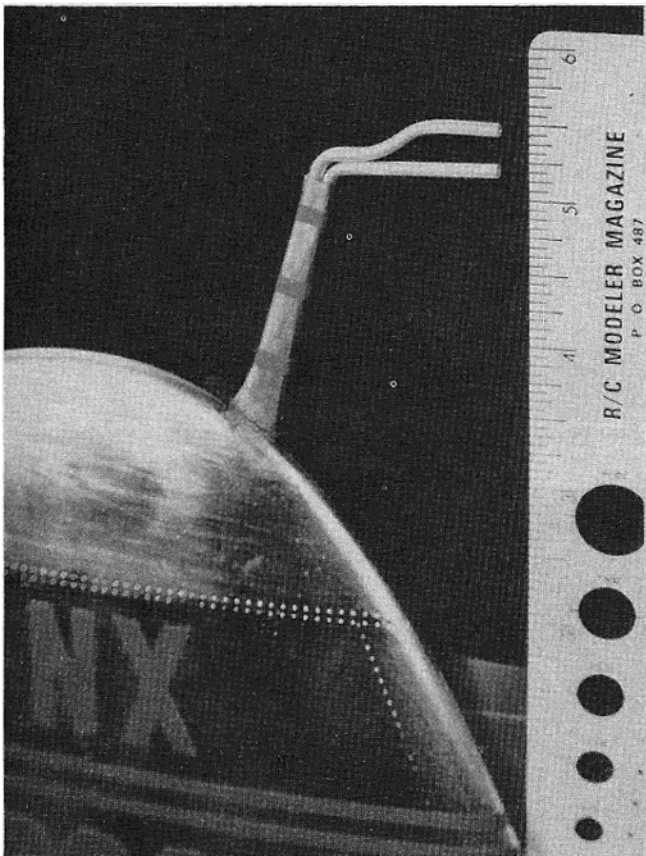
*Details of the wing flap control rocker assembly.*



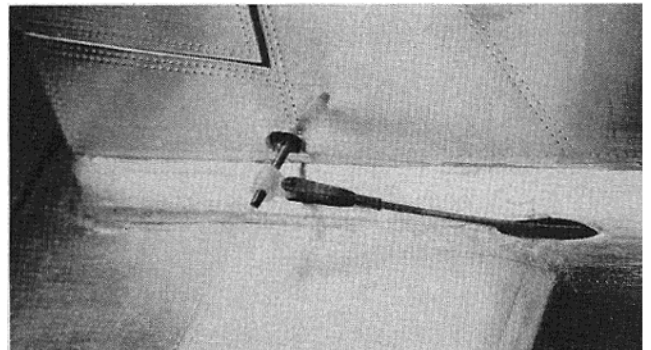
**Servo arrangement in wing center section. Servo on left actuates wheel brakes.**



**A Du-Bro 1/4 scale pilot was cut off as shown and decorated. It gives a realistic scale effect.**



**The pitot tubes help the static scoring.**



**A Goldberg aileron horn set was modified for use as a rudder control horn.**



**A simple stand bolted into wing mounting blocks is useful for safely transporting Little Dipper.**



**The Little Dipper is competitive as evidenced by the three trophies won within 30 days from first test flight.**

FB-1 and FB-2. This is a rather critical assembly and here is where we used 45 minute epoxy to allow enough working time to check and double check the alignment. Very small holes were drilled in the assembly for small nails used to secure the parts during the alignment checks.

The rest of the fuselage assembly is a fairly normal glue and trim approach. We used a good bit of large size balsa and trimmed it down to the proper size and shape. Soft, light balsa will make the job a lot quicker.

We suggest making provisions for the radio and pushrod installations before applying the bottom sheeting to the aft fuselage. This will provide easier access. You will note that the radio installation shown in the photos has a couple of features not normally seen. One is a rocker arm for nose wheel steering. Its purpose is to allow the stranded pushrod cable to run along the fuselage side forward to the nose wheel steering arm.

The other is the installation of the bellcrank micro-switch actuator for the Great Planes on-board ignition system. This ignition system has proven to be one of the most worthwhile features of the Little Dipper project by not only allowing an unbelievably reliable low idle for the Saito FA-90T twin but we also use it for starting the engine. It is a nice show-off gimmick to go to the flight line with only the airplane and transmitter. The micro-switch is adjusted to operate on the bottom 1/4 of the pushrod travel.

You will also notice both the on-board ignition and radio switches were mounted on a plywood stand-off with wire pushrods extending through the fuselage side.

We have used a multitude of the nice little accessory items manufactured by Carl Goldberg Models and Du-Bro Products, all of which are available through hobby dealers. The Goldberg 5/32 steerable nose gear set was used for practical (availability) reasons even though it compromised the true scale aspect. If you desire to go for the scale swept forward strut you can bend the lower strut to slant forward at the spring coil and insert a spacer between the nylon bearing block and the firewall for strut clearance. In either case a clearance hole must be cut in the bottom of the fuselage to allow strut installation.

#### Tail Surfaces:

Both the horizontal and vertical stabilizers were assembled using conventional leading and trailing edges and spars glued to the ribs. The balsa sheeting was applied and then the tip blocks were installed. The elevator and rudder were made of soft 1/2" sheet balsa. A Goldberg aileron

horn set was modified for the rudder control to make adjustments convenient and close to the fuselage. Du-Bro large hinges were used with the rudder and elevator installation.

#### Wing:

The wing design and construction is the simple old standard type that is assembled over the plans on a flat building board. Beyond emphasizing the flatness of the building board, our only other suggestion is to make good snug fits between all the parts. Then you can set the parts in position and Zap the structure together quicker than you can tell about it.

My favorite method of obtaining equal movement on the flap control is with an idler rocker and it is detailed on the plans. Care should be taken on final assembly to adjust for equal and precise flap deployment. The plans also show how I like to rig aileron differential at the servo output wheel. Differential is necessary on this type airfoil to prevent adverse yaw while banking.

The third servo, shown in the wing center section, operates brakes on the main gear. I was able to scrounge up a pair of the old Du-Bro drum brakes which have given us a lot of pleasure. The current Du-Bro coil spring brakes work just as well but aren't quite as realistic in appearance. A piece of 1/8" O.D. nylon tubing was built in each wing panel above the landing gear blocks to contain the nylon thread that runs up, across, and down between the wheels. Wheel brakes are a bit of a bother to install and adjust but the enjoyment is well-worth the effort and there are points given for proto taxi in scale competition.

#### Covering:

Since the prototype skins were of 2024-T3 Alclad aluminum and the parts having compound curves were made of 2 SO aluminum and were not painted, we decided to cover the model with chrome MonoKote. This proved to be a unique and frustrating experience and is the most difficult iron-on material to apply that this aged modeler has ever used.

Good buddy Joe Zdankiewicz came to my rescue and worked wonders. The secret is to work with higher temperatures and don't expect very much flexibility around compound curves. The chrome finish is like a mirror and the distortions in the reflections will drive you up the wall. To break up the surface reflections we used a 50¢ Singer tracing wheel intended for a seamstress to transfer pattern marks to fabrics. By rolling the wheel along a straightedge you can simulate rows of rivets which, while not quite to scale, are very effective in breaking up the surface into smaller areas.

The next step is to surround those

areas (one at a time) with a low tack masking tape. Then scour that enclosed area lightly back and forth in the same direction with a 3M green Scotch-Brite® scouring pad. Do not use steel wool, Brillo Pads or any other pads as Scotch-Brite® is the one that gets the effect. Mask and scour each area in a slightly different direction and you get the effect of aluminum panels. We smile a lot because we've been asked dozens of times, "Where did you get that aluminum covering?"

Coverite had not introduced aluminum Micafilm when we were building the Little Dipper. Since then I have been most favorably impressed with it. It is easy to apply, is excellent on compound curves, has good shrinkage and has a very realistic aluminum appearance. You might well consider Micafilm for your Dipper.

We had access to the original Lockheed markings drawing for the Dipper. Only the license numbers were described and the color was specified as simply "RED." The red 1" Coverite graphics numbers were used on the tail and numbers cut from red MonoKote went on the wings. We cut the wing numbers around patterns made from cardboard. Don't forget the old gimmick of wetting the wing panels with water containing a few drops of liquid dishwashing detergent to aid in positioning the numbers and eliminating bubbles. Also a baby sock pulled over your sealing iron is a big help when sticking the numbers to the wing covering.

There seems to be no documentation on the trim striping other than in photos of the final configuration. Our location for the trim was established by scaling the photos.

#### Flying:

Usually a construction article includes comments on the flight peculiarities of the model. In the case of the Little Dipper we don't know of any. All we can say is to make the normal preflight checks and have a go at it. This bird has given us nothing but sheer enjoyment.

In conclusion, I want to thank several people who graciously provided information to authenticate my Little Dipper project. Former Lockheed employees such as Tony LeVier, Bill Krecek, and Bob Wiehle loaned me an unbelievable number of obscure photos and original drawings. Little Dipper designer, Johnny Thorp, kindly reviewed and endorsed my documentation package. Gene Wallock and Don Dombroski helped me find sources for material. Joe Zdankiewicz not only rescued me with his know-how with chrome MonoKote but, as usual, his superb flying talent makes my flying machines look fantastic. Thanks again gentlemen. □