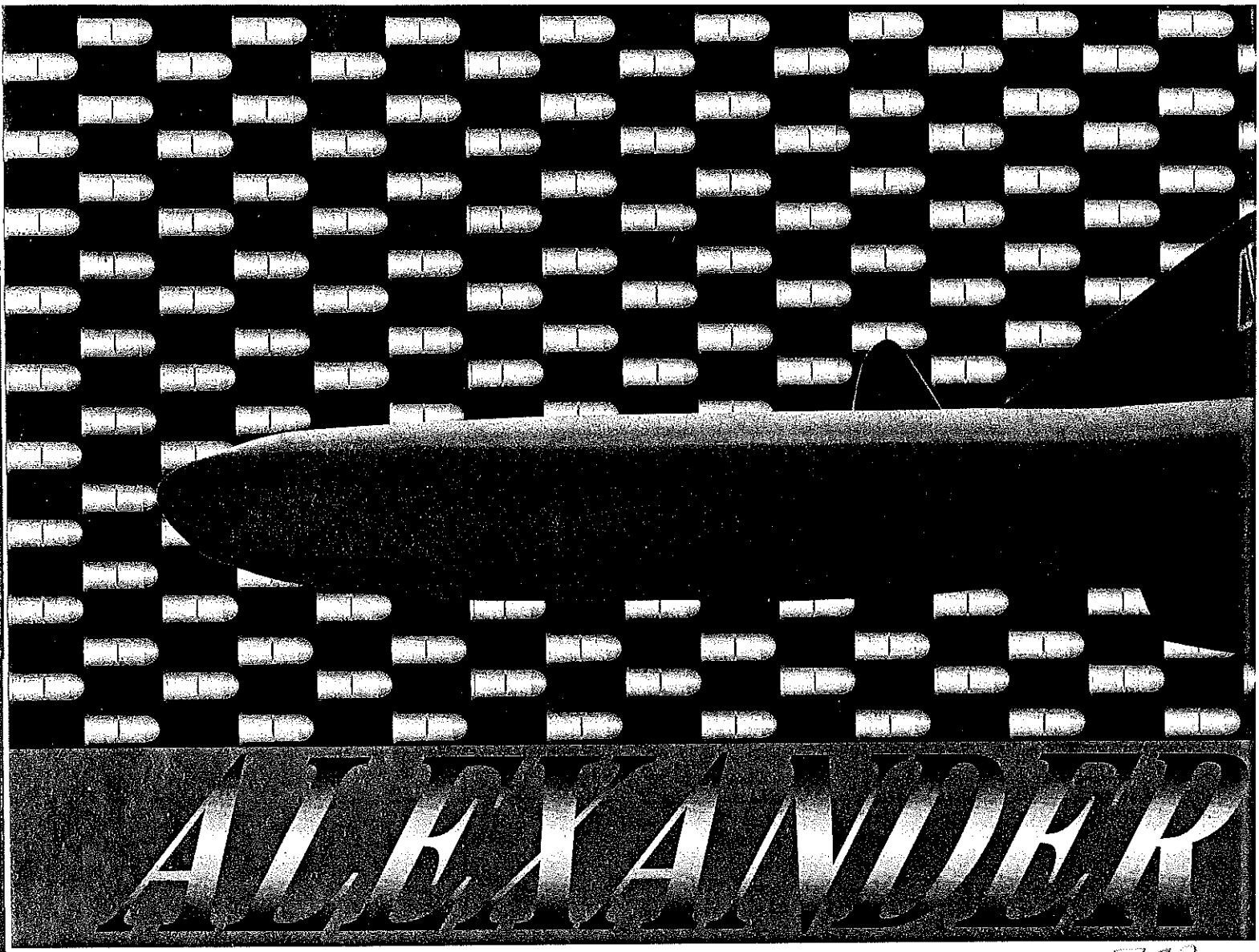
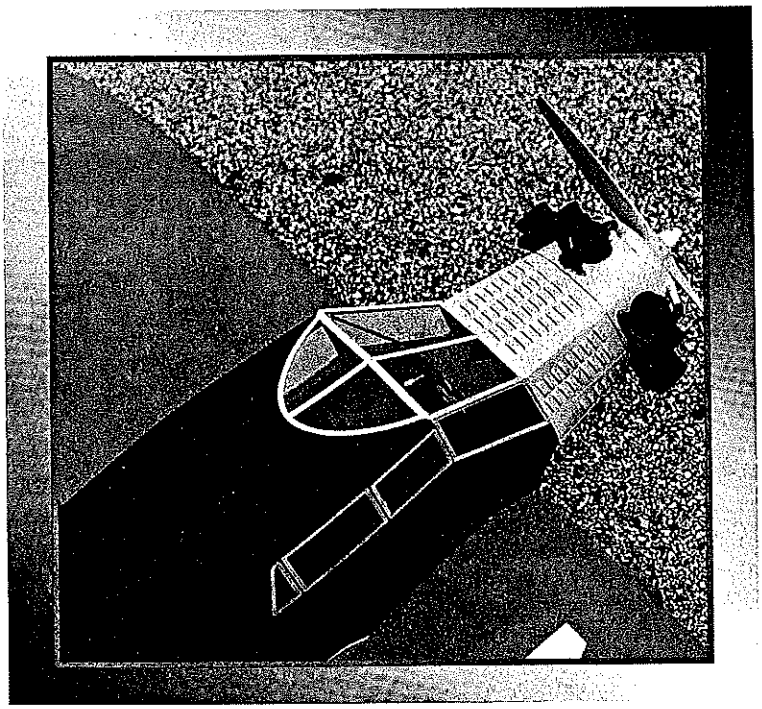


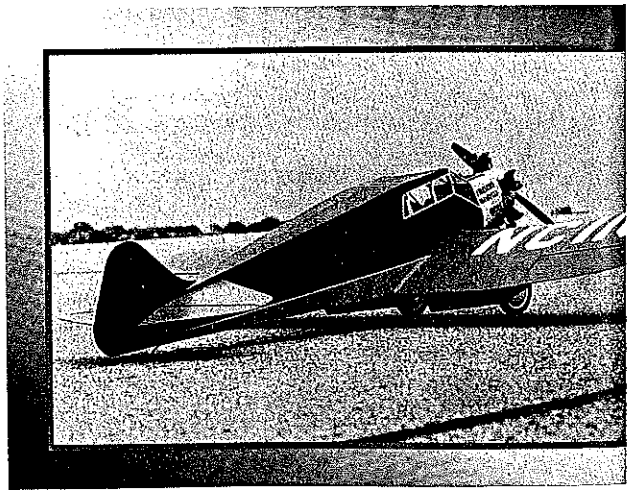
ALEXANDER

Our British autho
Alexander A

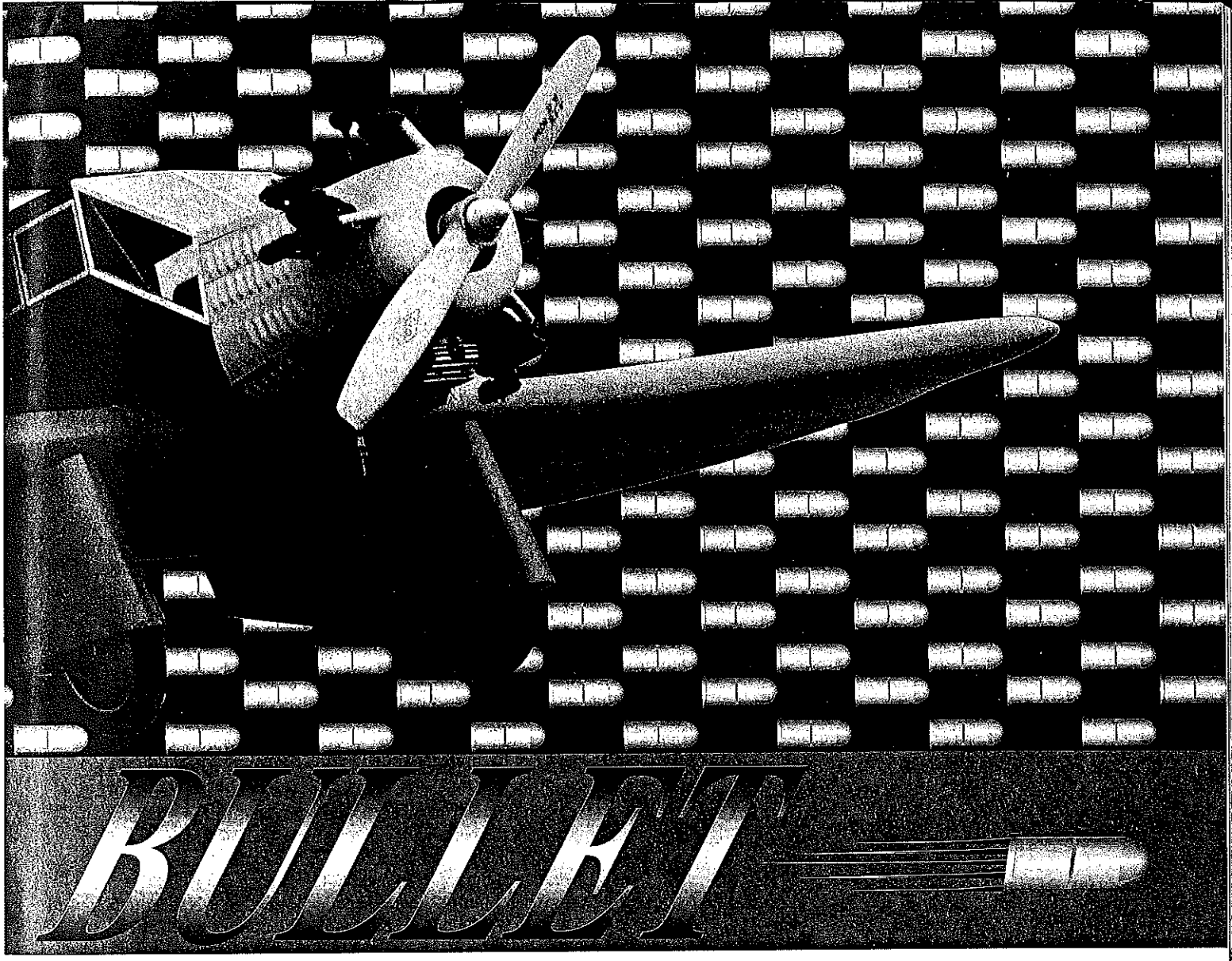


Photos by the author Graphic Design by Carla Kunz

The author made a punch and die to fashion the Bullet's cowl louvers. A Laser 50 supplies the power.



The Bullet is currently finished in a "fictitious" red-white-black Model was sized to fit Williams Bros. Golden Age wheels.



r has reproduced this 'most interesting' ircraft Company design from 1929

■ Phillip Kent

(Editor's note: the author is Scale columnist for the British publication Radio Control Models and Electronics.*)*

USE OF OUR CLUB FLYING field had been dramatically reduced as a result of having to apply for planning permission. Electric models and gliders were exempt from these restrictions, so thoughts turned in the direction of Electric power.

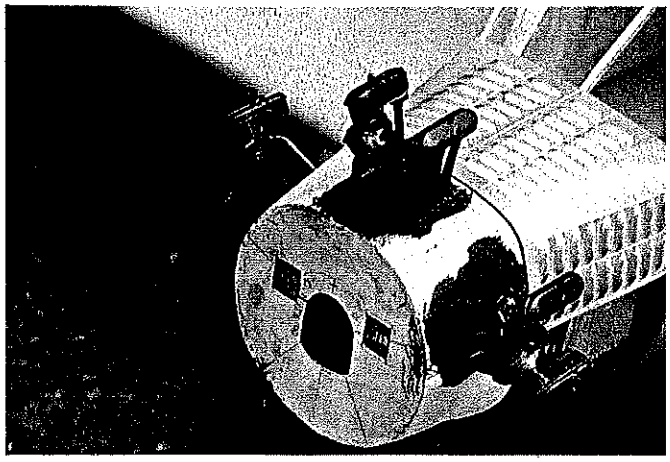
I was looking for an aircraft that could be used as a mount for a five-cylinder O.S. Sirius radial. One of the aircraft that I had looked at was the Alexander Bullet. Now a smaller version for Electric power seemed a good idea. Plans were drawn to a size that allowed me to use some 4⅝ diameter William Bros. Golden Age wheels that just happened to be in stock.

How is it, then, that the model presented here is powered by a Laser 50 four-stroke? The simple answer is cost. I could buy a couple of Laser 50s for the equivalent Electric motor, charger and battery packs that would be required for quality Electric flight.

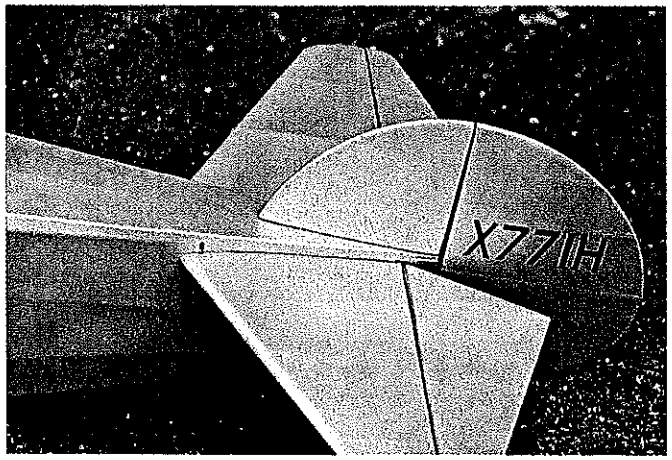
The Laser 50 was chosen because it was the shortest four-stroke around for its capacity, and I have always been very pleased with my other engines from this manufacturer. As it turned out, I feel that the model could have been built to ⅙ scale (72-inch wingspan) using this same engine.

color scheme.

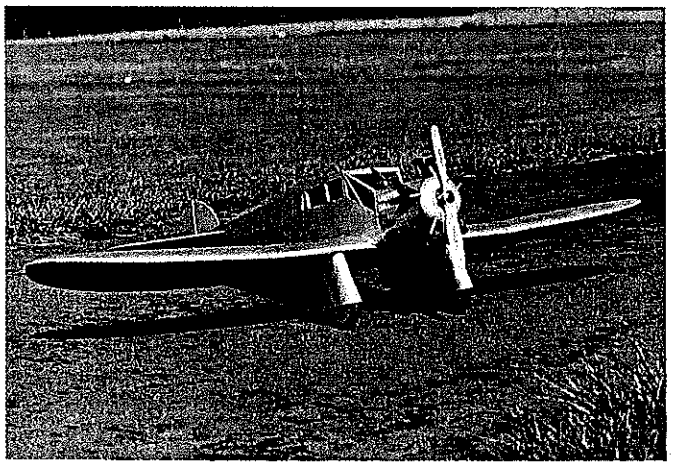
The original model was based on the mysterious one-off X771H full size aircraft. The model was built in rather a hurry, since I wanted to have it ready for Old Warden Scale Weekend. This was the reason for choosing X771H—it had



Dummy Wright J5 engine uses Williams Bros. 1/6-scale cylinders, modified to change inlet and exhaust manifolds.



Original model was outfitted with rounded fin and rudder; after a crash it was converted to version shown on plans.



The X771H version was chosen for its simple silver finish so the model would be ready for its first contest.

a very simple silver finish, with only the registration numbers and letters to be added.

CONSTRUCTION

I managed to build the Bullet in a couple of months, including time to draw the plans. The structure is pretty straightforward except for the outer wing panels.

Wing: My first task was to draw the plan view of the wing. I then plotted the shape of the ribs as they became smaller. I did the "plotting" by reducing the original rib section to the length required on a photocopying machine.

Once I had the required rib shapes, it was a simple task to work out the shape of the wing at the spar positions. Since there was quite a lot of curvature on the underside of the wing in the spar positions, it soon became clear that it would be of little use to try to use strip balsa for the spars. My solution was to use full-depth sheet balsa spars, slotted to accept the wing ribs.

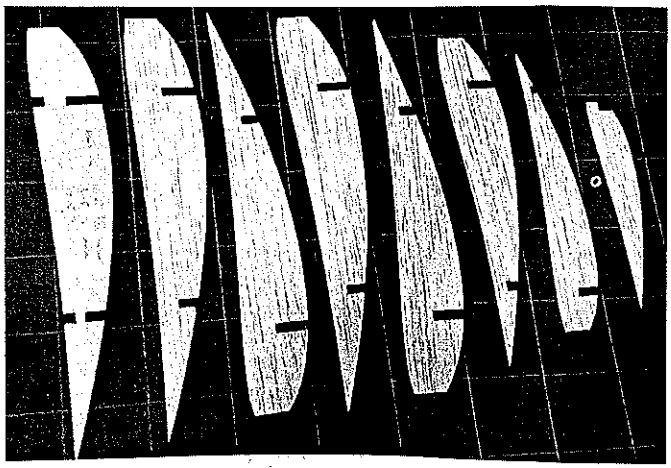
Not only did the underside of the wing curve up at the spar positions, it also curved up at the trailing edge (which was, in fact, the aileron). The aileron leading edge obviously followed the shape of the rear spar, but I could see the problems with the curved trailing edge.

I eventually decided to make the bottom of the aileron from 1/16 balsa sheet and use ribs on the upper surface to hold it in place. Had the model been larger I would have used the sheet balsa as a core and fitted ribs on each side. The sheet was pre-bent by stroking the balsa with a piece of one-inch-diameter aluminum tubing. This pushed the tube along the top surface of the sheet, which had the effect of making the sheet curl upward.

When I built the outer panels I decided to use packing pieces at each rib station on the spars and at the trailing edge. The ailerons were built integral with the structure, but provision was made to cut them out later. It was possible to do a trial dry run on the panels, since the whole structure slotted together.

The packing pieces were set up and the outer panels went together with little trouble. The center section used normal spars with vertical webbing pieces and suitable strengthening pieces where the undercarriage legs were fitted. The leading edge became a D-box section when sheeted and used a false leading edge to carry the sheeting.

I think that this is the best method to use when constructing a



Wing ribs are notched to accept full-depth sheet balsa spars, made necessary by the Bullet's unusual wing shape.

sheeted wing or one with a sheeted leading edge. For anyone not familiar with this technique, perhaps a few words would help:

When using sheet balsa on a leading edge the sheeting usually joins onto the spar at the rear and has to be fitted in some way to the leading edge. With some designs this can be a simple butt joint up against the leading edge; sometimes the sheet is wrapped over the leading edge. Both methods have disadvantages.

The butt-joint method requires that the fit between the sheeting and the leading be good; it is quite easy to push the sheeting out of line, causing it to be wavy where it fits up against the leading edge. Another undesirable feature is that there is a glue line that could show.

When the sheet wraps around the leading edge strip, we again have the problem of a glue line showing after sanding. Using a false leading edge gets over all these problems. A wing using this system is built as normal with the sheet going from the spars and over the false leading edge.

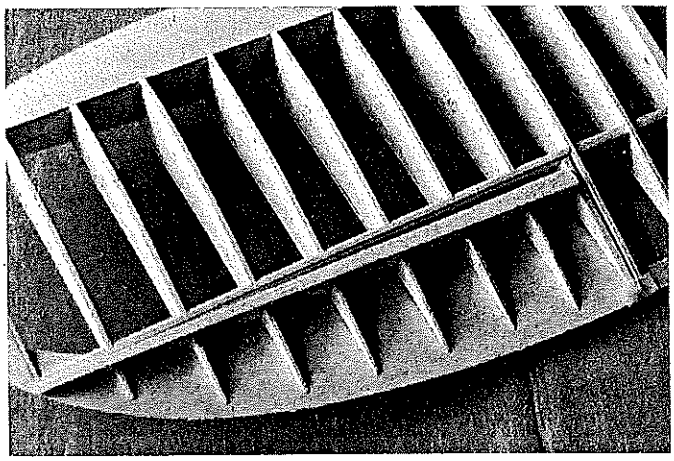
When all is dry the overhanging sheet is cut away and sanded, leaving a flat nose section ready for a final balsa leading-edge capping. I always use balsa cement for fixing on this capping piece, since it is the only glue I have found that does not give a glue bump. All that is then required is final shaping with a razor plane and sanding to the correct leading-edge profile.

For the Bullet's outer panels I used two laminations of 1/8 sheet balsa to form the leading edge. It is easier to bend 1/8 sheet than 1/4, and since the leading edge was curved, I thought that this was the best way to do it.

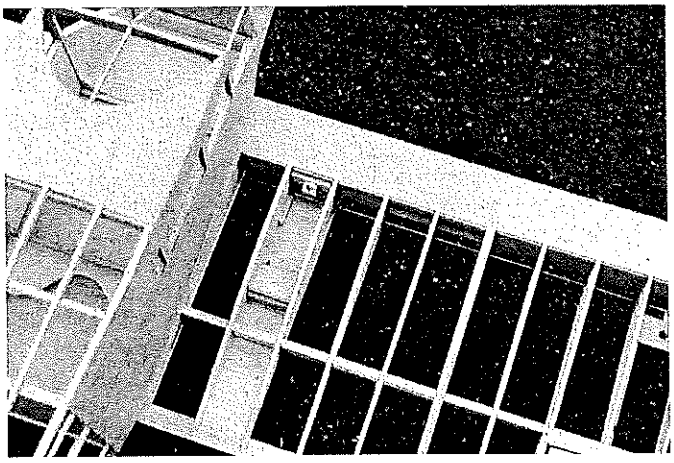
The center section is more normal, with 1/4 square spars and a D-box sheeted leading edge. The trailing edge is hard 1/16 balsa and all the ribs are capped.

The undercarriage bolts to plywood panels in the center section using standard commercial nylon clamps. The final length of the legs is determined after fixing. Brass tube axle brackets are soft soldered in place, with the wheels in position, so that they can be correctly aligned.

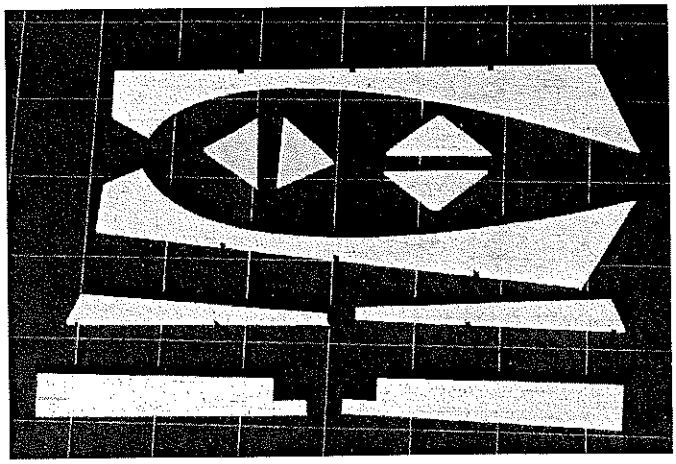
The undercarriage fairings are built up using 3/16 sheet for the top and bottom; 1/64 plywood is used for the rear part and litho plate for the rounded front. The full-size aircraft employed both the fixed version with trousers or a simple rearward retracting unit.



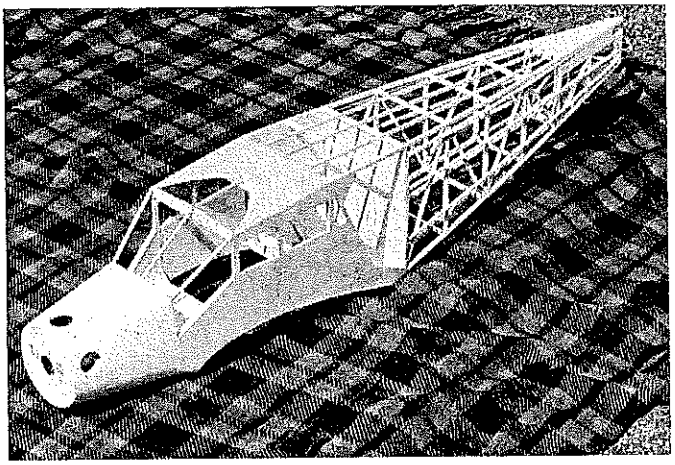
Aileron bottom is 1/16 sheet balsa that has been "stroked" (burnished) on one side to give proper upward curl.



Wing center panels utilize D-box construction. Note landing gear mount and aileron linkage routing.



Cabin parts are cut from 3/16 balsa. This portion of the fuselage is covered with 1/64 plywood



The fuselage is "a simple box filled out with stringers." Removable-front cowl is built-up from layers of 1/8 sheet balsa.

After only a few flights, a servo failure caused a crash; the Bullet was rebuilt as model X309V.

Fuselage: The fuselage is a simple box filled out with stringers. I notched the stringers in the 3/16 square uprights at the rear of the fuselage to keep them a reasonable size.

The only difficult area is the forward windscreen portion. Here the sides have to partially sawed through to get the correct plan shape.

The cabin area is covered with 1/64 plywood. I used lots of masking tape and glue here.

The cowl is built up from 1/8 sheet balsa. On my model this was split on the centerline to give access to the tank, and had a removable front part that housed the dummy engine.

The dummy Wright J5 engine is a big feature on this model, and I would recommend using the 1/6-scale Williams Bros. Wright Whirlwind plastic cylinders here. I modified these to change the inlet and exhaust manifolds; this is not too difficult using car-body filler and a saw and file. I decided at an early stage to make a punch and die to punch out the louvers for the cowl.

I would think that most 40 to 50 four-strokes would be suitable for this model. The Laser 50 is shorter than most, so it does not present too much of a problem when hiding it away. A four-ounce tank was mounted sideways in the cowl, but I have mounted a six-ounce tank into the fuselage on the rebuilt model. The instrument console does cover the tank within the cockpit area, so it is not visible.

Tailplane, Fin and Rudder: The tailplane is a little unusual in that it is made in halves that are butted onto the fuselage sides; aluminum tubes hold the halves in place. The elevator is fitted after this operation through the slot in the rear of the fuselage. A simple litho-plate cover was made for this gap on the model.

The tail surfaces use the popular and practical core method of construction. The cores are 1/16 soft balsa with 3/16 spars and 1/8 sheet ribs to fill out the airfoil shape.

Covering and Finishing: I used Sig Koverall for covering the wings and fuselage and Solartex for the tail surfaces and ailerons. On the rebuilt model I have used the new silver Solartex for the wings and fuselage. I have had to paint over this though which has lost the advantage of this material I suppose. Suffice to say that if the whole model had been covered in silver Solartex I wouldn't have had to do any silver paint work.

Silver is a very common color for full-size aircraft, and it is one that presents problems to modelers. I have used cellulose-based paint, but the local paint store didn't have the Ford "Silver Fox" that I wanted. As an alternative I decided to try a silver spray can, which has proved to be satisfactory.

The model was clear-doped after covering the rib tapes cut from lightweight tissue, added to the wings and tail surfaces. Since the model was built to a relatively small scale, I didn't bother with simulated stitching.

Since I was using a cellulose finish, I decided that a white primer would be best. These days the primers used in the automotive trade are of the high-build variety—not suitable for a fabric-covered model aircraft. I did manage to find a spray can of white primer, and this has worked well.

The first silver that I used was a silver wheel paint. This looked most unrealistic and was very bright. I then tried a normal

ALEXANDER BULLET

Type: RC Sport Scale

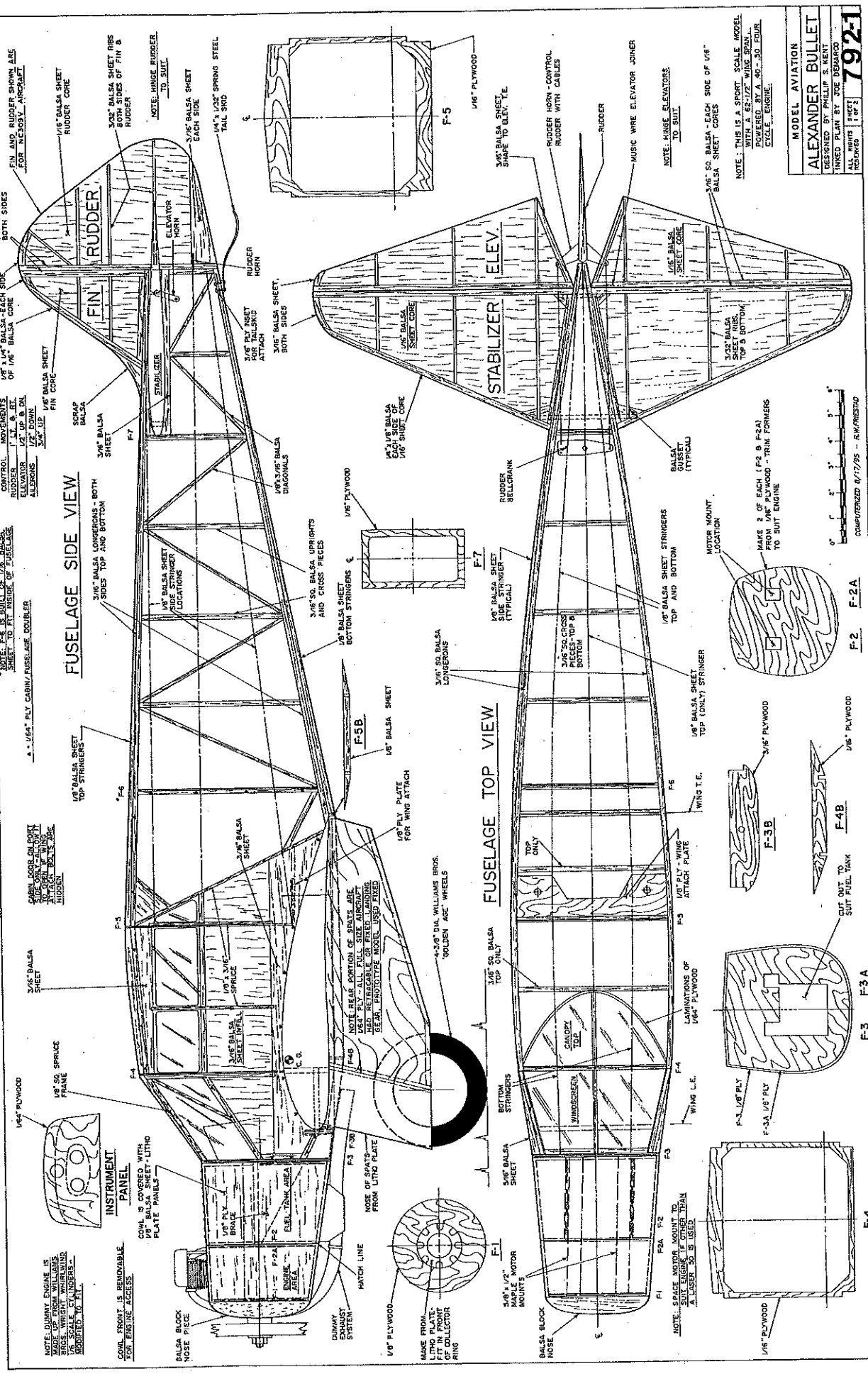
Wingspan: 62½ inches

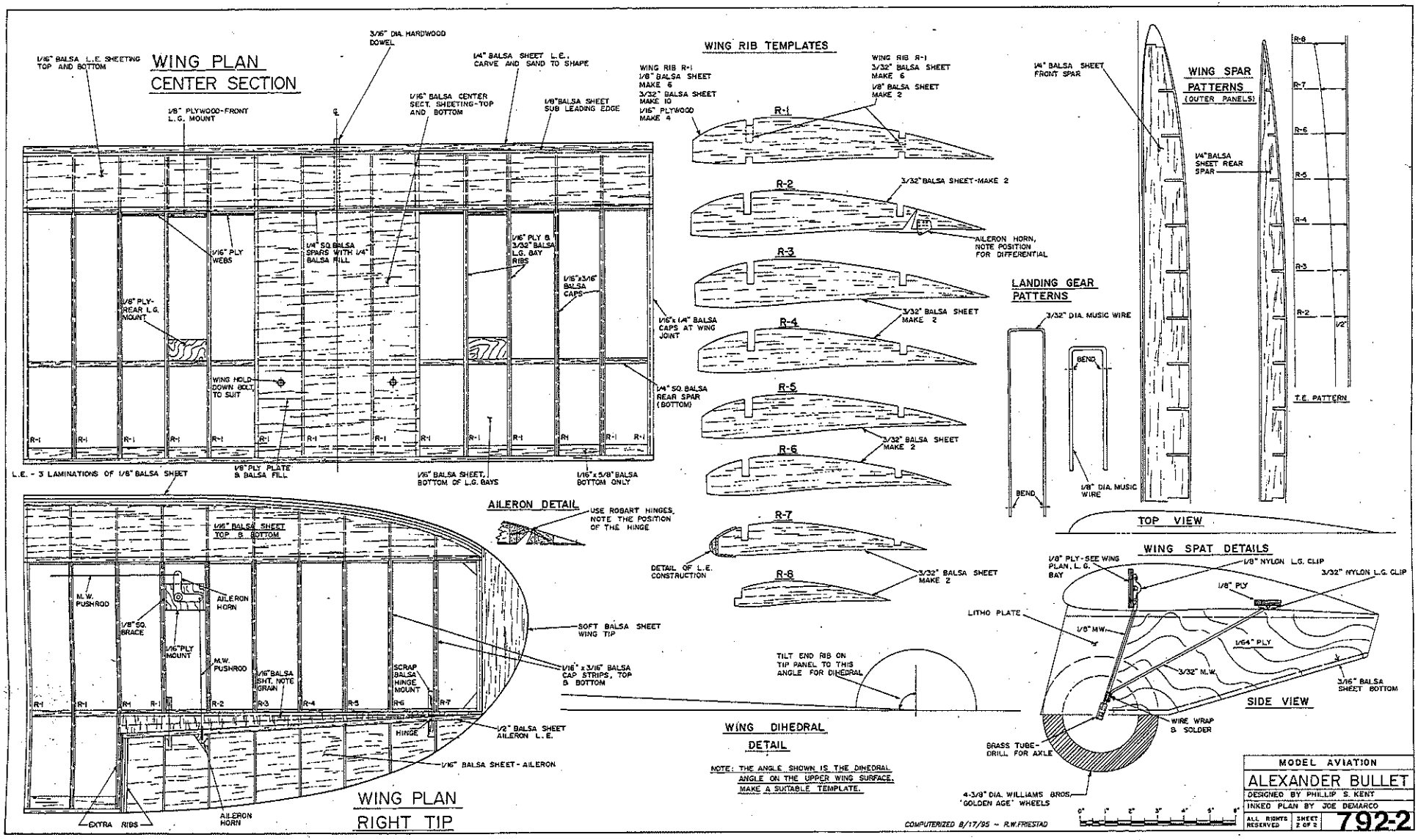
Engine size/type: 40-50 four-stroke

Functions: Rudder, elevator, throttle, ailerons

Construction: Built-up

Covering/finish: Koverall and Solartex


MODEL AVIATION
ALEXANDER BULLET
DESIGNED BY PHILLIP S. KENT
INKED PLAN BY JOE DESMARDO
792-1
FUSELAGE SIDE VIEW
FUSELAGE TOP VIEW
FIN
RUDDER
STABILIZER
ELEV.
INSTRUMENT PANEL
F-1
F-2
F-2A
F-3
F-3A
F-3B
F-4
F-4B
F-5
F-5B
F-6
F-7
COMPUTERIZED 6/17/95 - R.W.PRESTHO


WING PLAN
CENTER SECTION
1/16" BALSA L.E. SHEETING TOP AND BOTTOM
3/16" DIA. HARDWOOD DOWEL
1/4" BALSA SHEET L.E., CARVE AND SAND TO SHAPE
1/16" BALSA CENTER SECT. SHEETING-TOP AND BOTTOM
1/8" BALSA SHEET SUB LEADING EDGE
1/8" PLYWOOD-FRONT L.G. MOUNT
1/16" PLY WEBS
1/4" SQ BALSA SPARS WITH 1/4" BALSA FILL
1/16" PLY & 3/32" BALSA L.G. BAY RIBS
1/16"x3/16" BALSA CAPS
1/16"x 1/4" BALSA CAPS AT WING JOINT
1/8" PLY-REAR L.G. MOUNT
WING HOLD DOWN BOLT, TO SUIT
1/4" SQ BALSA REAR SPAR (BOTTOM)
L.E. - 3 LAMINATIONS OF 1/8" BALSA SHEET
1/8" PLY PLATE & BALSA FILL
1/16" BALSA SHEET, BOTTOM OF L.G. BAYS
1/16"x 5/8" BALSA BOTTOM ONLY
WING RIB TEMPLATES
WING RIB R-1 1/8" BALSA SHEET MAKE 6 3/32" BALSA SHEET MAKE 10 1/16" PLYWOOD MAKE 4
WING RIB R-1 3/32" BALSA SHEET MAKE 6
1/8" BALSA SHEET MAKE 2
R-1
R-2
3/32" BALSA SHEET-MAKE 2
AILERON HORN, NOTE POSITION FOR DIFFERENTIAL
R-3
3/32" BALSA SHEET MAKE 2
R-4
R-5
3/32" BALSA SHEET MAKE 2
R-6
R-7
R-8
3/32" BALSA SHEET MAKE 2
1/4" BALSA SHEET FRONT SPAR
WING SPAR PATTERNS
(OUTER PANELS)
1/4" BALSA SHEET REAR SPAR
T.E. PATTERN
LANDING GEAR PATTERNS
3/32" DIA. MUSIC WIRE
BEND
1/8" DIA. MUSIC WIRE
TOP VIEW
AILERON DETAIL
USE ROBART HINGES, NOTE THE POSITION OF THE HINGE
DETAIL OF L.E. CONSTRUCTION
WING SPAT DETAILS
1/8" PLY-SEE WING PLAN, L.G. BAY
1/8" NYLON L.G. CLIP
3/32" NYLON L.G. CLIP
1/8" PLY
LITHO PLATE
1/8" MW.
1/64" PLY
3/32" M.W.
3/16" BALSA SHEET BOTTOM
SIDE VIEW
WIRE WRAP & SOLDER
BRASS TUBE-DRILL FOR AXLE
4-3/8" DIA. WILLIAMS BROS. 'GOLDEN AGE' WHEELS
1/16" BALSA SHEET TOP & BOTTOM
M.W. PUSHROD
AILERON HORN
1/8" SQ. BRACE
1/16" PLY MOUNT
M.W. PUSHROD
1/16" BALSA SHT. NOTE GRAIN
SCRAP BALSA HINGE MOUNT
SOFT BALSA SHEET WING TIP
1/16" x 3/16" BALSA CAP STRIPS, TOP & BOTTOM
HINGE
1/2" BALSA SHEET AILERON L.E.
1/16" BALSA SHEET - AILERON
EXTRA RIBS
AILERON HORN
WING PLAN
RIGHT TIP
TILT END RIB ON TIP PANEL TO THIS ANGLE FOR DIHEDRAL
WING DIHEDRAL
DETAIL
NOTE: THE ANGLE SHOWN IS THE DIHEDRAL ANGLE ON THE UPPER WING SURFACE. MAKE A SUITABLE TEMPLATE.
COMPUTERIZED 8/17/95 ~ R.W.FRIESTAD
0" 1" 2" 3" 4" 5" 6"
MODEL AVIATION
ALEXANDER BULLET
DESIGNED BY PHILLIP S. KENT
INKED PLAN BY JOE DEMARCO
ALL RIGHTS RESERVED
SHEET 2 OF 2
792-2

silver spray can, and again the finish looked too bright.

There was not too much that I could do about this unless I started again, so I decided to spray over with matte Aerokote fuel proofer. This was quite fantastic—what had looked awful now looked just about right. The only problem was that my small hobby airbrush was not good enough for the job, resulting in a patchy finish.

Simulated metal framing: The lettering was cut from Solartrim sheet, and after positioning was sprayed with matte Aerokote. The dummy engine was painted with Humbrol matte enamel and a silver spray can.

The final job before fitting the radio was glazing the cockpit and cabin area. In the rush to get the model ready on time, I used silver painted masking tape for the framework. This looked all right, but I did make litho-plate replacements on my return from Old Warden.

The full size aircraft balanced at 28% of the wing chord. I made the model balance in the same place; the engine is quite heavy and the battery can easily be moved within the large cabin. The rudder and elevator servos were mounted at the back of the cabin to get the correct balance position.

The internal cabin fittings consisted of the instrument console and seats. The console was made from card and thin plywood; the seats are balsa.

Flying doors: The door was a working door so that the wing bolts could be hidden within the model. On the first flight, the door managed to detach itself from the model and was lost. The new door uses a Du-Bro latch, which is most reliable.

Flying: The fin and rudder looked rather small when the model was finished, and quite a few experts expressed the view that I might have trouble with directional stability. These fears were unfounded and the model flew straight off the board.

The model's second outing was at Liverpool, where it took part in the Kings Cup air race. This meeting was great fun and the model handled very well, gaining joint second place. Landings and takeoffs were particularly easy on the grass field.

Phillip Kent
32 Moorbottom
Cleckheaton
West Yorkshire BD19 6AD
England

Chipley three-quarter view see page 19.

This Bullet Won't Spin

The Alexander Aircraft Company of Colorado Springs, Colorado produced more than 900 aircraft during the late 1920s and early 1930s. The Eaglerock biplane was produced in large numbers, but the most technically interesting of the Alexander designs was the Bullet.

The Bullet was a cantilever low-wing monoplane that was capable of transporting four people at a cruising speed of 150 mph (this was at least 15 years ahead of its time). Another advanced feature was the retracting undercarriage, which no doubt helped the excellent performance figures of the design.

The Bullet was introduced to the public at the 1929 Detroit All American Aviation Show. With orders for 86 aircraft placed at the show, the future of the company looked secure, but there were to be problems.

The Bullet made its first flight on January 12, 1929 and pilot Ted Haneter reported, "She flies like a dream." During the test program the Bullet made a flight over the summit of Pikes Peak (14,110 ft.) with four people on board. At 17,000 ft. the fuel pump drive sheared, causing the engine to fail. Pilot Lee Brusse glided the Bullet back to the airfield (15 miles away) and made a safe dead-stick landing.

If that was a close call, it was just the beginning of a series of events that nearly caused the demise of the company. On another test flight, violent elevator flutter was encountered. Pilot Frank Niswander decided to land immediately. As the flying speed was reduced the flutter ceased.

All went well until the aircraft was flared out for landing, when Niswander pulled the stick all the way back. The Bullet touched down, tail up, and would have run off the airfield but for a fortuitous ground loop. The flutter had stretched the elevator cables so that at only ½ inch of up could be achieved.

Commercial aircraft had to pass CAA certification tests before they could operate. One of the tests was a spin test—six spins in each direction before recovery. The Bullet had proved to be a very stable aircraft, and it would not spin. Modifications had to be made to the design so that the spin test could be completed.

The design team finally got the Bullet to spin, but at the critical full-aft center of gravity (CG) position the spin was flat and practically impossible to get out of. Four Alexander Bullets crashed during the spin tests, and two pilots were killed. Another redesign of the airframe.

In its certification test form the aircraft used both a fixed and retracting undercarriage. The fixed-undercarriage version used trouser fairings—much more convenient for the model. The model was originally designed for Electric power, but due to the high initial cost a normal internal combustion engine was used.

The model based on test aircraft X771H inherited some of the bad luck of the full-size design. On its sixth flight the aileron servo failed, and the model was severely damaged in the resulting crash. During the rebuild the more-attractive fin and rudder shape of aircraft X309V was fitted and a new paint scheme of forest green and silver was used.

The model has a wingspan of just over five feet, and is very easy to fly under radio control. It is able to perform maneuvers that would not be encouraged with the real aircraft, and it will not spin!

Phillip Kent

MORE ON 19

ALEXANDER · BULLET

PHILIP S. KENT