


REPUBLIC P-47N



BETTER KNOWN AS THE "THUNDERBOLT," AND MORE AFFECTIONATELY TO ITS PILOTS AS THE "JUG," OUR P-47 HAS DONE SAME OUTSTANDING JOB FOR ITS MODEL PILOT.



Steady as a rock is the best description of the flying qualities of our "Jug." Wheels down, landing approach as seen over the pilot's shoulder.



Our author with the fixed gear version of the P-47N. Engine is really lost under that huge cowl, but it certainly does permit good cooling.



First chance we had to see the nose brute was at the '62 Nats at Glenview, Ill., and in its first year of competition, did a creditably good job.

By R. L. SCHELLENBAUM

► The well-known Republic P-47 "Thunderbolt" was one of the more effective single-seat fighters of WWII. It was conceived as a high altitude turbo-supercharged fighter (40,000 feet) to cope with the Messerschmitt climb and maneuverability at 16,000 feet. In March 1943 the "Jug" became operational in the European theater. 15,329 P-47 were produced to December, 1945 when it was discontinued. Two-thirds of the total were employed overseas in combat, where the score was 4.6 enemy planes destroyed for every P-47 lost in the air.

At the end of fighting in Europe, longer range was required for escort duty in the Pacific war. Republic added 18 inches to the wing of the classic P-47D along with squared tips, larger ailerons, dorsal fin, wider wheel spread, and thus evolved the P-47N. Power was a 2100 hp Pratt and Whitney R-2800-5, 8-cylinder, double row radial engine. Armament consisted of eight .50 caliber machine guns in the wings, two 1000-pound bombs and ten 5-inch rockets under the wing, and fuel tank or one 500-pound bomb under the fuselage. The gross weight rose to 20,000 pounds. Wing area was 322 square feet.

Information for the model was taken from the Air Age Technical Manual (published by M.A.N.) and W. Musciano's scale U-control model in the 1954 Air Trails Model Annual.

The original model presented here and in the photos was constructed in 1960 and is still in existence although somewhat bent and possibly retired after a mishap last June. The flight count was forgotten some years ago at a total of 200. The plans were drawn earlier and reflect the design thinking of that time, the then available power of the Torp 35, the killing effects of a hot summer day at Albuquerque altitude (1 mile), and the desire for an every-day plane and full performance after all the labor. That is, scale wing, stab, and aileron areas were increased to a degree not very obvious by eyeball. True scale (Continued on next page)



Rear view of the "Jug" shows attention to good scale details to help garner those extra contest points. Louvered cowl helps engine cooling.

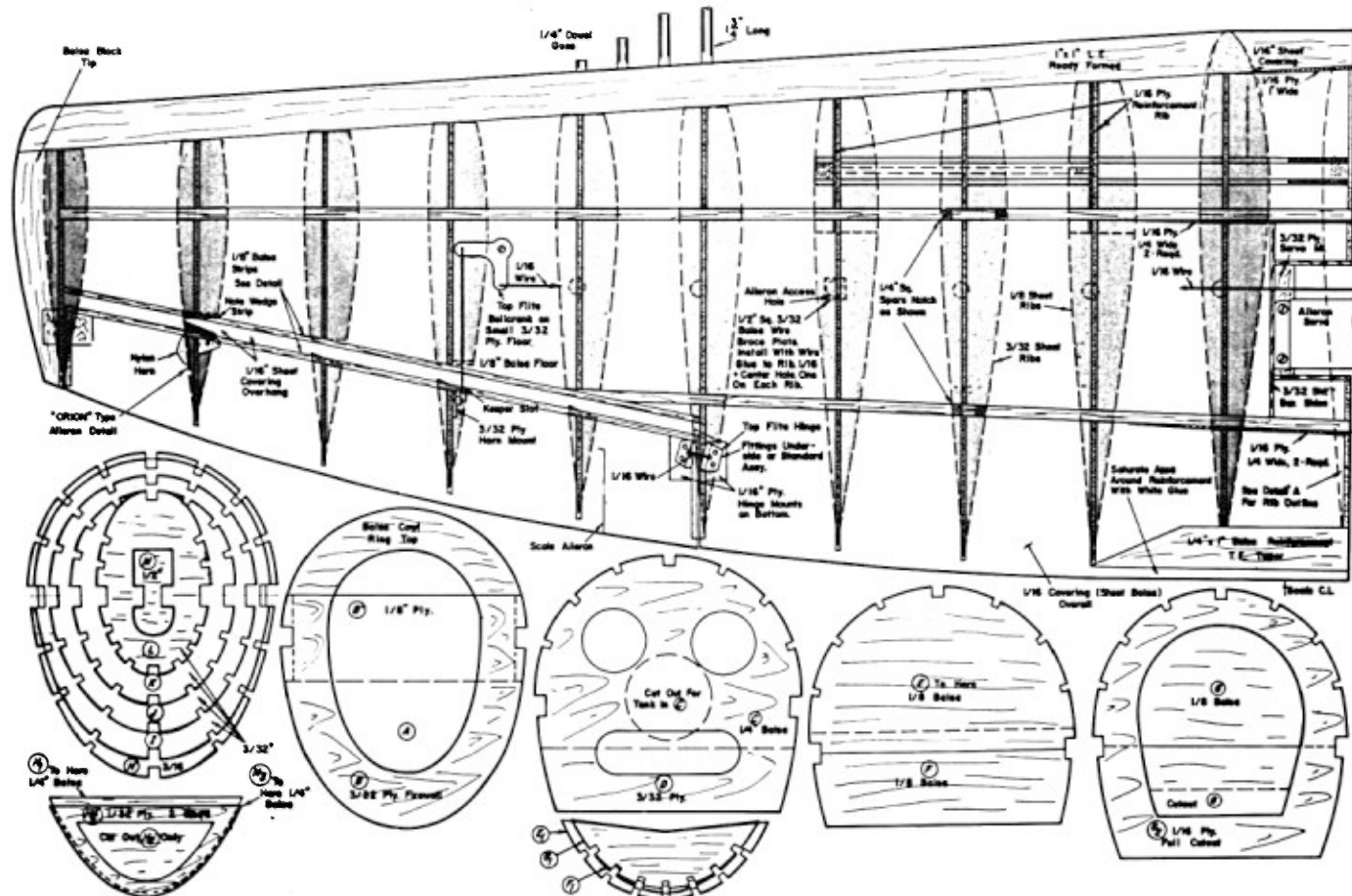
REPUBLIC P-47N . . . Continued

dimensions are included in the plans and can be followed without difficulty at reasonable wing loadings, especially at lower altitudes.

The P-47N makes a good choice for this type of model. However, so do a surprisingly high percentage of successful full-size aircraft. Aerodynamic layout comparisons are remarkably close, even with R/C contest types. It is also interesting that scaled wing loadings (weight $\frac{1}{3}$), power loadings (within a factor of 2 or 3), flight speeds, and even airfoils obtained, particularly for WWII jobs. The most significant deviations from model proportions is the low stabilizer area common to full-size planes. This is probably not as critical as generally supposed (*Continued on page 54*)



Don't know name of author's other scale project but he is proud of his Pop's good work in scale. Pilot and cockpit details have been added.



Republic P-47N

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above, say 17%. It is now felt that the increase in area from nearly 19% scale, for the 47, to 22% was not as crucial as first thought. 14% stab area has been observed to work very well on a 9½ pound "Moth" and others (taking 80% of the wing area) with sufficiently available surface movement for slow speed. Certainly, a 25% stab is better and is important to the hard-nose contest flier but a smaller stab, carrying a proportionate percentage of the total weight (more forward CG), does not tremendously increase the amount of flying required. Characteristics contributing more directly to the "scale don't fly" mystique are high wing loadings, excessive decalage, tail-heavy CG location, up-thrust, warps, and lack of adjusting and flying experience. Careful adjustment can reduce the requirement for large corrective and stabilizing forces at the tail section. Proportional control is also advantageous through handling capabilities, i.e., smooth control of highly loaded beasts on take-off and landings close to pay-off.

The P-47 has an especially good arrangement of forces. It is not an extreme low-winger due to generous dihedral (6°) and a wing position high in the fuselage which places the center of wing resistance and

lateral CG location. Thus, forces, which vary in different ways with velocity, are highly concentrated with short moments and the set-up is very similar to a mid-winger. This permits all adjustments to be made as close to 0-0 as possible relative to the thrust line (depending upon loadings, airfoil, etc.) and makes for neutral type stability groovy flight, and the possibility of obtaining a single trim adjustment which holds over the entire speed range. This optimum adjustment is attained in ordinary models at about 40% CG position on the wing. A rearward CG induces the effect of up-elevator at low speeds (lower Reynolds number) because the lower aspect-ratio stab of usual symmetrical section is decreased in relative efficiency and the constant weight is then a larger factor compared to the other vertical forces. Optimum adjustment obtains when no re-trimming is required after chopping the engine for landing, elevator surfaces are level with the fixed stab at neutral control setting, and the nose pulls neither up or down when the engine is gunned from low speed in flight. However, 40% CG can be dangerous at low speeds and heavy loadings in the way of sudden pay-off and snapping. 35 to 37% is safer at first, along with a dab more incidence, if necessary, and compensating downthrust. Conversely, adjustment in this direction increases upright stability, but requires more re-trimming inverted and at various speeds. The balance of these factors is a matter of personal preference and the fact that more than 95% of the pattern is spent effectively upright. Dihedral also increases upright stability with little noticeable effect inverted or in rolls in the usual unexaggerated configuration. The above considerations are all readily detectable in flight if one takes the time to vary adjustments around and about to

delineate and arrange each individual force effect—as is possible in different maneuvers and conditions of flight. True flying surfaces are a "must" and, along with fine adjustment and loadings, will generally overshadow all the rare design features and rudder shapes ever devised. Once you've had one right, you'll never be satisfied with less.

In short, true FLYING scale models, capable of class III and full-scale flight performances, can be produced with attention to light wing loading, compromise with weighty details and finish, and close adjustment. A number of such models have appeared in recent years. Non-hardnose scale builders can also cheat a little, although this is a distinct disadvantage in scale contest work since commensurate points for scale flight are not awarded as yet. Anyway, the added kick derived from a good flying scale model is well worth the extra time, effort, and only slight reduction from best possible performance.

Original specs were: approximately 700 square inches wing area, 6 pounds 14 ounces weight, 22.6 oz./sq. ft. wing loading, and Torp 45 engine. Flight characteristics can be described as nearly identical to an Orion with, possibly from larger lateral area, better roll action. The ship flew easily through the entire AMA pattern except for a power struggle in the vertical-eight. The increased aileron area proved unnecessary but was retained with original movement for reserve control and quick maneuvers low to the ground. Considerable elevator and rudder movement was used for the same reason but requires more concentration on smoothness with reeds. Maximum movement was set for the tightest possible loop without dangerous snapping tendencies. The large control surfaces function efficiently and a very solid, consistent feel was noted over the entire speed range. Adjustment procedures and values were virtually identical to comparable contest types with no peculiarities.

The effects of fuselage drag and prop efficiency are frequently questioned because of the large frontal area. These appear fairly minor overall since speed and pull-through do not differ greatly from other models. Large drag area is not all bad, though, but serves to reduce, mainly, the top of the speed range because the force varies as velocity squared, and therefore smoothens the flight appearance.

With time the weight increased from repairs, installation of retractable landing gear, and larger engines. The final configuration includes a ST 60 with Digicon proportional and weighs 8 pounds 2 ounces. As should be true with proper adjustment, within limits, no modifications were required for the higher wing loading and added power. Only an upward shift of the speed range limits was evident.

Ground handling problems, arising from two-wheel gear and large rudder and lateral area weathervaning, were encountered. This was overcome with the installation of individual wheel brakes operated from the aileron servo. A simple method devised long ago by Jack Blything was employed, it connects the brakes to the servo arm with 6-pound nylon fishing leader through a guide of the smallest available aluminum tubing epoxyed in the wing and exiting beside the landing gear wire. The fairly elastic leader absorbs much of the servo strain during engagement at the end of travel. Standard braking on low throttle can still be accomplished with one wheel or by rapidly alternating.

Adjustments have been discussed and values are shown in the plans. The thing is to be sure they are actually there, for a first flight off the board with no surprises. Block the plane up on a flat surface with

the stab level with the surface. This is the critical measurement. Determining wing incidence with a "square" ruler on the surface to the point of contact on the leading and trailing edges, avoiding parallax. Check before covering the body to allow for modifications to the wing pocket. Thrust can be checked in the same manner replacing the prop with a straight stick. Set the CG at 4¾ inches max. from the leading edge at the body and adjust to taste later.

Construction is largely self-explanatory and will be described only briefly.

Wing The airfoil is similar to the 2400 series progressing towards a symmetrical section at the tip by the rotation-at-the-leading edge method for reducing airfoil dimensions. The leading edge is the largest, readi-formed, medium weight available. The wing is fully sheeted with 1/16 medium and quite hard at the trailing edge. Use white glue for sheeting the wing except on the leading edge and between sheets where sanding of the glue joint is required. The white glue gives longer working time and reduces buckling between ribs from shrinkage of the glue fillet which develops between the rib and sheeting. The white glue trailing edge and saturated center part are very durable. The rubber has never marked the trailing edge, nor has the main wing structure been damaged, through a number of cataclysmic events. The removable fuselage undersection was constructed with the wing banded in place on the body after covering the wing to include the full skin strength.

Tail The rudder and stab frames are built of medium to hard balsa and covered with soft and medium, respectively.

Fuselage The original was covered with medium to soft 1/16. However, 3/32 sanded down would be easier and gives more wood to work with. The skin-stressed, egg-shell type nose construction has proven out very well, is light, and leaves room enough for your foot. In a clobber the firewall peels off the butt joint on the body and is generally not driven back into the gear. The nose sides have been merely pulled back slightly into place and the firewall and cowl ring replaced. The original body sides and plywood are still intact, after a number of the above operations, with only a small nick in a front corner. The engine is mounted upright in the airflow through the top part of the cowling.

A finish of about 13 ounces was obtained by brushing on Aerogloss clear full strength with little sanding until the silk is completely filled. After letting it dry a few days, the dope was cut down very close to the silk with 320 and 400 sandpaper wet and dry. Color was a minimum covering coat of Aerogloss aluminum spray which was amazingly durable. Insignia and numbers were cut from Scotch plastic tape on glass. The present markings are the scheme with white cowl ring and stripes on wings and stab edged in black, not pictured.