

Northrop Gamma

by John Hunton

JACK NORTHROP'S early all-metal full-scale airplanes significantly influenced future aircraft design by pioneering the use of stressed aluminum skin, multicellular construction, and drag-reducing wing fillets. Early 1930s Northrop types included the Alpha, Gamma, DC-3, and, later, the Douglas SBD. The fixed landing gear of the Gamma was covered with distinctive aerodynamic spats, and the aircraft introduced a fully enclosed cockpit.

On June 2, 1933, Frank Hawks flew his Gamma 2A "Sky Chief" from Los Angeles to New York in a record 13 hours, 26 minutes, and 15 seconds. However, perhaps the most famous Gamma was the "Polar Star." On November 23, 1935, Lincoln Ellsworth and Canadian pilot Herbert Hollick-Kenyon used it to attempt the world's first trans-Antarctic flight.

The Polar Star ran out of fuel only 25 miles short of the goal. Its crew took six days to travel the remainder of the journey on foot. The airplane was recovered and donated to the Smithsonian National Air and Space Museum, where it now resides.

I chose the Gamma as a model to develop because of its Art Deco appearance and unique "park bench" ailerons. I am presenting two versions of this aircraft for you: the Texaco racer and the Ellsworth Polar explorer.

The prototype model has been flown for

several months, and it has been proven to be an excellent performer with a wide range of speed. It will fly very fast, yet it will slow nicely for a gentle landing.

The historic Gamma is a fine sight to see in the air again. The model is powered by a Li-Poly battery and spans 42 inches. Its flying weight will come in at slightly more than 16 ounces.

CONSTRUCTION

It is suggested to have the Gamma parts laser cut from $\frac{1}{16}$ medium-weight balsa, for accuracy and ease of construction. The balsa stringers and spars replicate metal joint lines on the full-scale airplane to the extent possible. Use extremely light balsa for the empennage.

The fuselage is built in half shells over the plans. Be sure to install the $\frac{1}{16}$ square former reinforcement members on the half formers. Pin down the top and bottom longerons, and glue the formers into place.

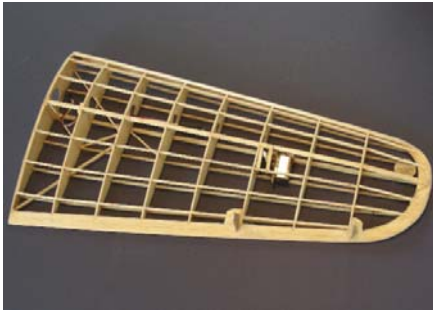
Install the midfuselage stringer to stabilize the formers, and then add all other stringers. Use soft balsa soaked in water for the most difficult and curvy stringers. If you spray the completed half shell with a mist of water and let it dry before you take it up, this will help stabilize everything.

Glue the fuselage half shells together, and remove the top and bottom longerons where

*Weather your
park with a piece
of pioneer
history*



The prototype Northrop Gamma model was originally trimmed to replicate the Lincoln Ellsworth version. Covering in silver tissue was light but unsatisfactory. Fillet tissue was adhered with Sig Stix-It so it would not pop up after doping.



The wing structure is simple. Diagonals were put in to provide rigidity during the sanding process. A nickel in the right wingtip is an effective antitorque device. A mini-Pico servo has been installed.



The fuselage is built in half shells. Then those are mated, creating a nice, light framework. Some stringers in the wing-fillet area take on difficult curves; use light balsa soaked in water to install those.



A partially completed frame sits on the bench amid construction clutter. The Gamma is starting to take shape! The completed model should weigh slightly more than 16 ounces.

indicated (in the cabin and wing root areas). Install the spar joiners in the wing roots.

Sand the fuselage with the sandpaper wrapped over a small plastic bottle to get into the curved places. Assemble the motor mount to suit your particular power plant.

To build outer wing panels, place the main spar on the plans and add all of the ribs, noting that the inner rib is slanted slightly. (See the rib-slant template.) Install the top spar to stabilize the ribs.

Add the LE and TE and then all of the remaining top spars. Take up the wing panel, and install the remaining bottom spars. Sand the wings with fine paper on a lightweight block; be careful not to deform the airfoils.

To build the scalelike three-dimensional empennage, pin down the main spar, add the ribs and LE, add the top spars, and then take the assembly up and add the bottom spars.

Assembling the built-up tailplanes to the fuselage is facilitated by installing the fin, with its king post, into the fuselage and then attaching each stabilizer half to the king post and fuselage side. You might want to cover

parts of the rear fuselage before installing the tailplanes.

Covering and Finish: Install all RC gear, servos, motor mount, and battery chute before you cover the fuselage. I removed a portion of the wing center-section to allow me to put in the servos and receiver. Then I covered the area with a patch for access after the Gamma is covered.

Cover the model with lightweight tissue. To conceal the difficult wing-fillet area, use small pieces of covering material or even bond paper for best results. Using silver tissue has proven to be difficult, so I suggest that you employ white tissue and dope or spray it silver.

Choose your desired decal trim from the plans. You can get water-slide decal sheets

from McGonigal Paper & Graphics in clear or white that can be produced on an ink-jet printer. Use clear decal sheets for this project.

One crucial aspect of rigging the completed model is to set up the park-bench ailerons parallel to the *bottom* surface of the wing. One might think that they should be parallel to the top of the wing, but they do not work at all in that configuration. I know from experience.

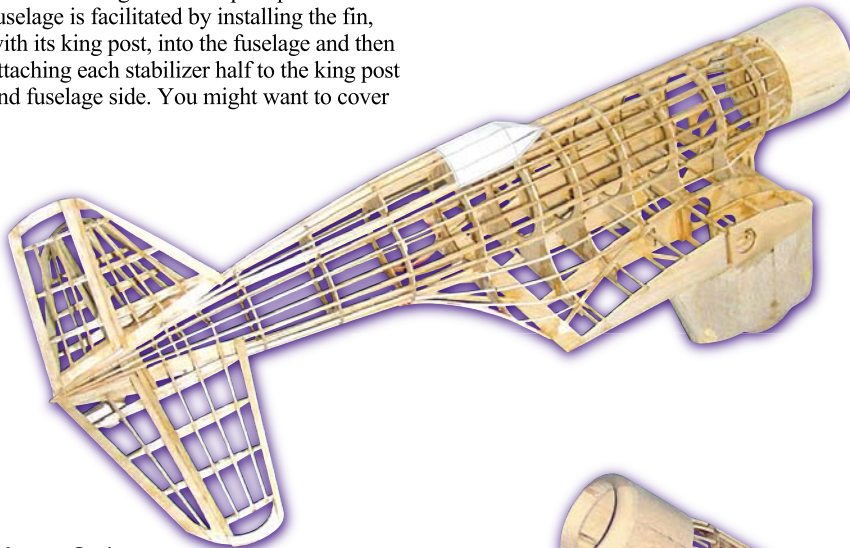
Because this airplane requires coordinated rudder to turn properly, it might be best to couple aileron and rudder actions with either the servos or the transmitter. Rig the elevators and ailerons to move approximately 20° and the rudder to move 30° to each side.

Add any ballast necessary to make the Gamma balance where indicated. Steam out warps.

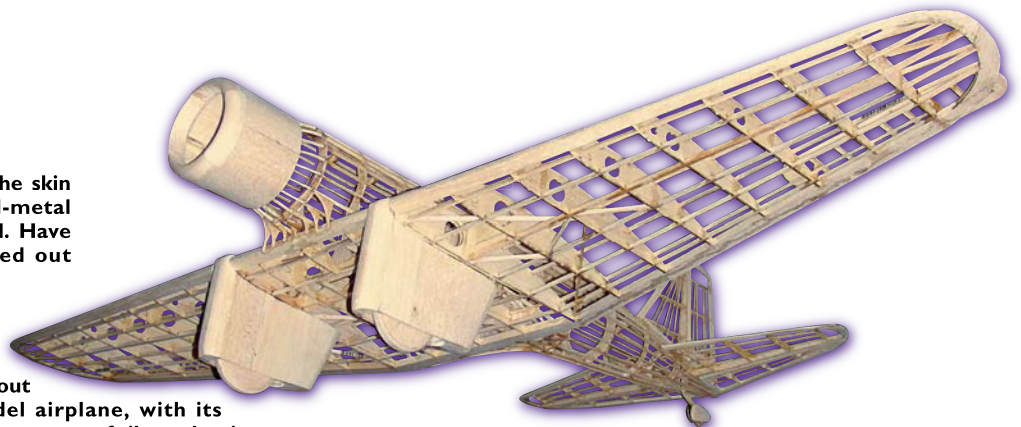
Test-run the motor for the simulated duration of a full flight and check for overheating of the wires or power components. I recommend taping a nickel under the right wingtip for at least the first flights; that will neutralize any torque effects. (Contact me if you want to know why.)

I recommend an AXI 2208/34 motor with a 1320 mAh, three-cell Li-Poly battery. I cut an 8 x 3 GWS propeller to 7 inches in diameter, to the profile shown on the plans. This works well, but a 7 x 4 will do okay too.

Flying: Models this size seldom do well landing on or taking off from grass. However,



Above: Stringers and spars are spaced to approximate the skin panels and rivet seams of the first all-metal airplane, which Jack Northrop designed. Have the radio-equipment locations worked out before covering the structure.



Right: There is something beautiful about the framework of an uncovered model airplane, with its exquisite delicateness and the repetitive patterns of ribs and stringers.



The prototype model was covered with nonsilvered Japanese tissue and then painted with a light coat of Krylon silver and trimmed as the Texaco racer. Silver dope could have been used and would have been somewhat lighter, but the airplane has a good margin of performance.

the version with skis seems to land on grass better than the wheeled version does.

If powered with the recommended motor and battery, the Gamma should weigh close to 16 ounces. It is a “skyrocket,” so do not hesitate to launch it at a healthy upward angle—20° or so—and full power for the first flight.

The airplane will climb quickly away from the dangerous ground, and then you can sort it out and trim it. A silver model will blend into the sky quickly, so keep it relatively close until you are familiar with its unique shape.

Throttle back and try some stalls to build your confidence with this aircraft’s excellent slow-flight characteristics. Then you will be prepared to land it at a slow velocity.

One of the great things about the growing trend of electric power is our newfound ability to build practical and good-flying scale models. This design recreates a classic airplane that had a bearing on aircraft design for many years.

Wikipedia on the Internet provided me with quoted information and supplies references to more information about the Northrop Gamma. **MA**

*John Hunton
huntonj@comcast.net*

Sources:

McGonigal Paper & Graphics
(215) 679-8163
www.mcpaper.com

AXi motors, GWS propellers:
Hobby Lobby
(866) 512-1444
www.hobby-lobby.com

Wikipedia
www.wikipedia.org



Models this size seldom do a good job of landing or taking off from grass, but the version with skis seems to land better on grass than the wheeled version.



The battery compartment is a sloped box, accessible from the bottom of the fuselage. Notice the on/off power switch. Do not transport this model with the Li-Poly battery installed.



Left: "Park bench" ailerons and aft-located cockpit make this a classic airplane to model. Roll control is adequate for performing scalelike flight. Rudder in turns is required.

Below left: The Gamma flies off on another mission, this time with the Ellsworth finish, complete with skis. The 42-inch-span model flies excellently and has a wide range of available speeds, as did the full-scale aircraft. It's fast like a racer, yet nice and slow for landings. Stall characteristics are outstanding.

Below: Choose your model's decal trim from the plans. You can get water-slide decal sheets from McGonigal Paper in clear or white that can be printed on an ink-jet printer. Use clear decal sheet for this project.



Northrop Gamma

Type: RC semiscale park flyer

Skill level: Intermediate builder and pilot

Wingspan: 42 inches

Wing area: 300 square inches

Length: 24.25 inches

Weight: 16 ounces

Power: AXI 2208/34 outrunner; three-cell, 1320 mAh Li-Poly

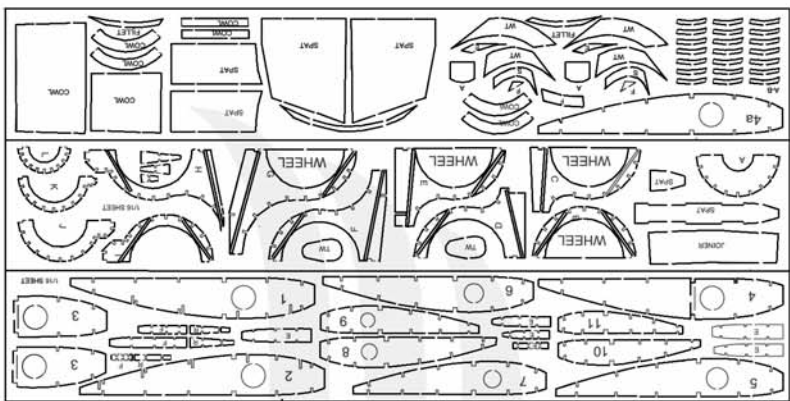
Construction: Balsa

Finish: Tissue or similar

Propeller: 8 x 3 three-blade GWS, trimmed to 7 inches in diameter



Don Srull hand-launches the Gamma during early tests. Pat Daily photo.



REFERENCE FOR LASER CUT PARTS

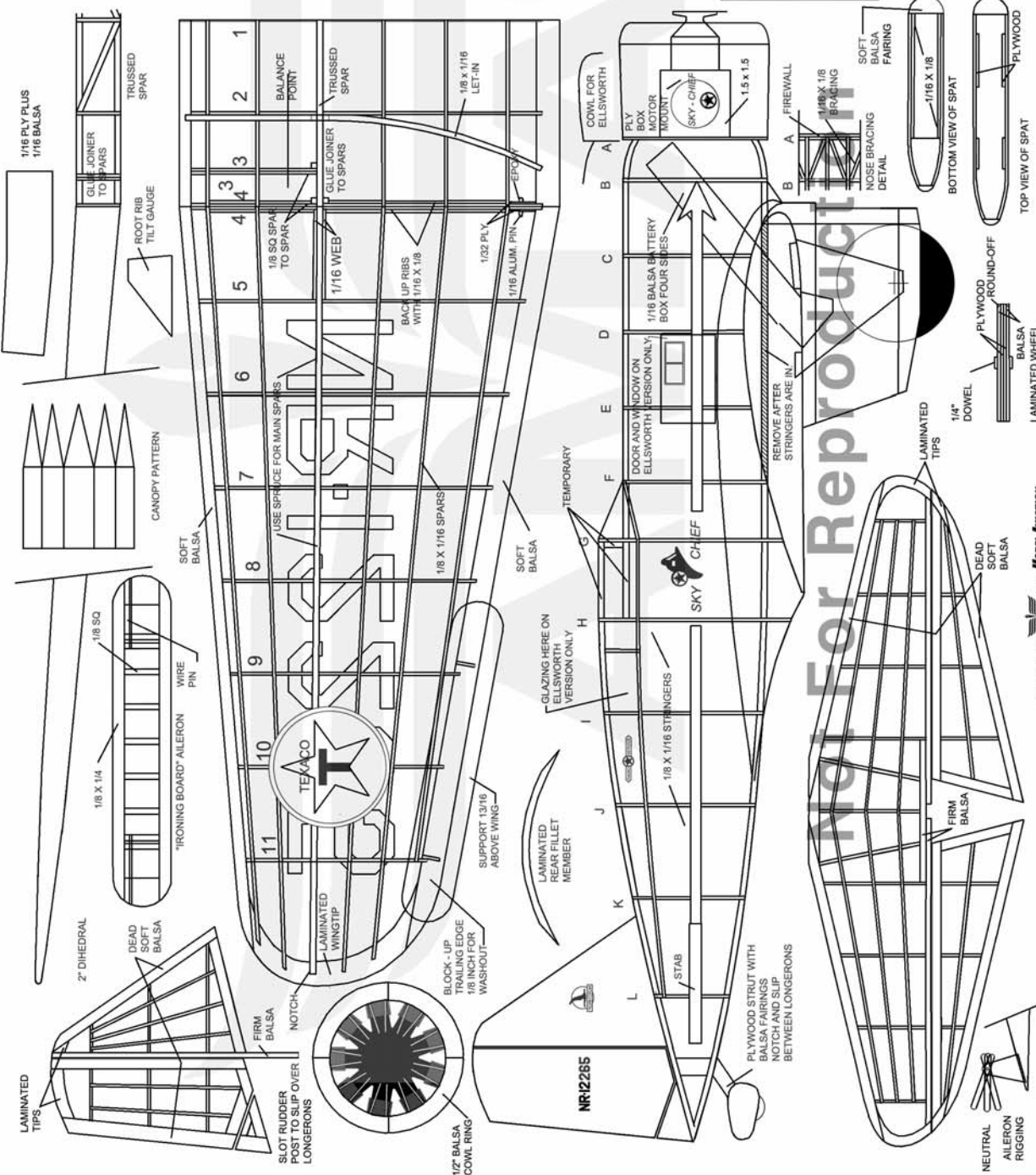


NORTHROP GAMMA

Plan No. 1048

42" SPAN 300 SQ. IN. AREA
 WEIGHT = 16 OZ.
 POWERED BY AXI 2208-34
 3 CELL 1320 mAh LFPOLY
 3 BLADED GWS PROP THINNED
 AND CUT TO 7 IN DIAM.

DESIGNED BY JOHN K. NORTHPROP IN 1932
 MODELED BY JOHN H. HUNTON IN 2008



Not For Reproduction

Copyright 2010 AAMA and Model Aviation

