

SEVERSKY

P-35

A U.S. fighter plane without a popular name? Yes, the P-26 Peashooter came before it and the P-36 Hawk and P-40 Warhawk after. It's immediate factory descendant was the P-43 Lancer but the Seversky P-35 was known only as the P-35. Although it didn't have a catchy name, the P-35 was a very historical aircraft and the Granddaddy of the P-17 Thunderbolt.

Seversky's fighter went into operational service in 1937 with the three fighter squadrons stationed at Selfridge Field, Michigan. The squadrons were equipped with the total buy of the P-35 (76 aircraft). This was a year before the Hawker Hurricane MK1 was operational in England, and the Hurricane at that time had a lot of fabric covering and a wooden two blade prop. The Seversky P-35 was, in fact, the first USAAC fighter to have an enclosed cockpit, metal covering without wire bracing, and three retractable wheels. It was the first of our modern low wing fighters and operational at a time when the U.S. Navy was still ordering biplanes.

An early model of the Pratt & Whitney twin row Wasp R-1830 engine powered the P-35. The original 850 hp pushed the plane at a top speed of 280 mph. Later models of

this engine hit 1150 hp in the P-36, 1250 hp in the P-43 and F4F Navy Wildcat, and more than that in the B-24 bombers. Civilian versions of the Seversky P-35 won the Bendix Trophy Race two years in a row (1938, 1939). Jackie Cochran set numerous speed records with the plane and Jimmy Doolittle flew one for Shell Oil. These civilian versions of the plane give modelers a different choice of paint schemes including gold, green, and yellow. The military versions came out of the factory in shiny aluminum.

Foreign countries liked the Seversky fighter so well that they ordered more than this country. The Japanese bought 20 and others went to South American Countries. The biggest order was from Sweden and half of the planes (60) EP1-106 aircraft from

this order became P-35A's when they were held back by the U.S. and sent to bolster the defenses of the Philippines in 1940. These P-35's saw combat against the Japanese in December 1941, but for a very short time. Most were knocked out on the ground as were the other USAAF aircraft based at Nichols and Clark. The P-35's were still in their bright silver finish when the Japanese attacked and they said that they could see them from 50 miles out.

If the P-35 was so famous, how come we have not seen any R/C models of the type until now? I was asking myself that question when a friend of mine, Dr. Kitson, first interested me in building a model of the plane. Bob Kitson remembered the P-35 from his early days in Michigan and had collected 3-views and other documentation over the years. When he learned that I might try an R/C version, he loaned me the whole package and the project just grew from there. I decided that maybe scale modelers had not tried the P-35 because it had a short nose and tail moment, narrow gear, and a lot of projecting parts that would have to be

Joanne Knight in red, white, and blue, matches the colors in Col. Art Johnson's new model of the Seversky P-35. The 1/5 scale model is covered with .005 thick aluminum sheet faithfully duplicating the USAAC first all metal, retract equipped fighter. Joanne's scale modeling Hubby, Wayne, called for Art and the P-35 at the recent "Top Gun" Tournament.

**A true scale model of a unique fighter produced prior to WWII.
By Col. Art Johnson, "Master Modeler."**



familiar with the details. Closer to my home is a P-35A that was restored by the USAF Museum and is now in the Weeks Air Museum in Miami, Florida. These are the only remaining P-35's and both look like they just came out of the factory complete with buffed aluminum finish.

There are a number of 3-views of the P-35 with the most detailed being Wylam's drawings. These drawings are loaded with dimensions — supposedly of the original. When I put these dimensions in a computer CAD program and tried to reproduce the bulkhead drawings, it was apparent that something was wrong. If I had built a model with these bulkhead sections, it would have turned out very strange indeed. The drawings by Paul Matt turned out to be better and the Williams Brothers improved on these.

For my own drawings, thanks to cooperation from the people at the Weeks



Museum, I was able to actually measure all the details of the aircraft and put the correct dimensions into my own computer drawings. It sure helps to know the exact width of the wheel fairings, the length of the scoops, and many other similar details. For this reason I used the markings and details of the P-35A in the Weeks Museum for my own model. It is painted like the 17th Pursuit Squadron P-35A of the Squadron Commander as used in 1941 in the Philippines. If you build the version of the P-35 in the USAF Museum, you would not have to make the gun blisters or the extension to the carburetor scoop that was added as a modification to the P-35A as it appears in the Weeks Museum.

CONSTRUCTION

Scratch-building a scale model from plans is not a task for beginners, so we are going to assume that anyone attempting this model has some scale building experience under their belt. Some building techniques on this model were a bit different, however, and some tips on these might be of interest.



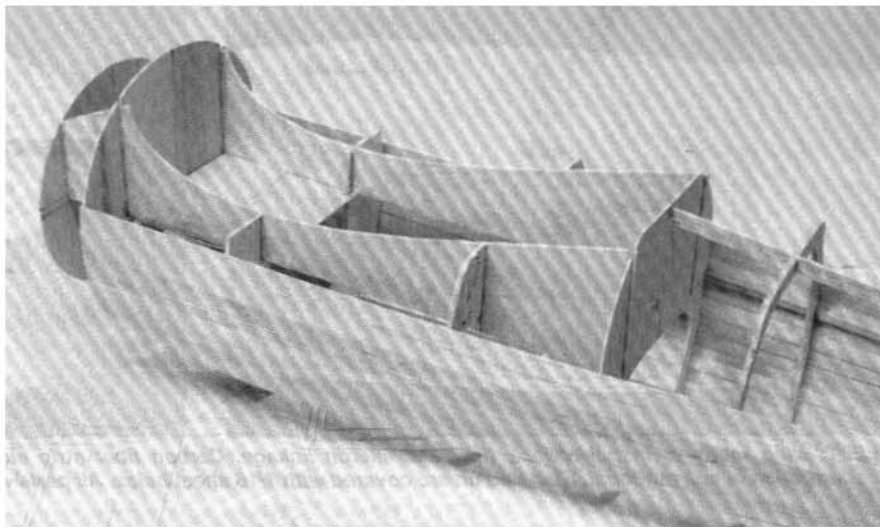
The P-35 fuselage is built standing on its nose. A plumb bob hooked at F-10 helps keep everything lined up while strip planking is added. Robart Incidence Meter checks level for bulkheads.

As usual, I like to get the tedious part of building out of the way first — meaning the wings. Besides, it is easier to fit the fuselage to the wing than the other way.

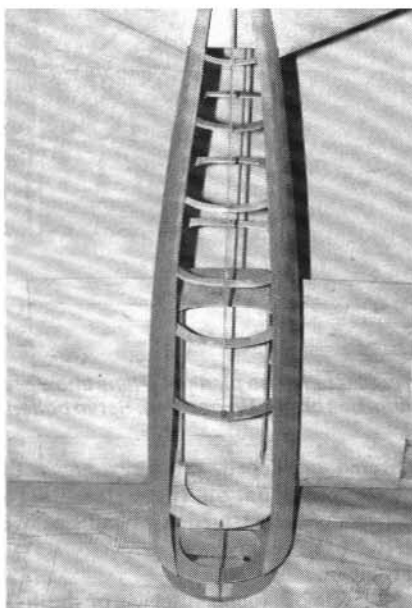
Wing:

Seversky came up with his own airfoil for the P-35. He called it a CYH. I am only guessing if I call this a Clark Y Hybrid. It does have a flat bottom over much of the chord but with a fairly sharp leading edge and a definite reflex at the trailing edge. I used the scale airfoil because past experience has shown me that most models will fly decently with the same airfoil as the original. This was going to be a built-up balsa wing because cutting an elliptical wing from foam looked like too sticky a project. No two ribs on the wing have the same thickness percentage due to the elliptical shape. Generating rib drawings of this type on the computer is pretty straightforward — by hand it's another story.

The position of the main spar is dictated by the need to retract the wheels partially into the wing. The ply spar running past the gear mounts provides the strength needed for "not so nice landings." I made up the



Fuselage structure starts with bulkheads assembled on 1/8" lite ply wing crutch pieces.

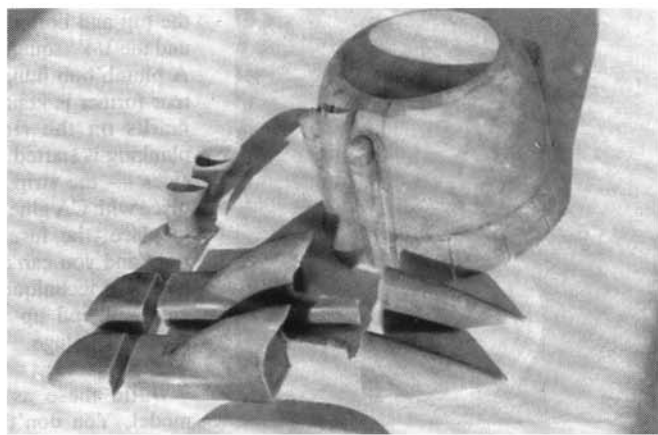
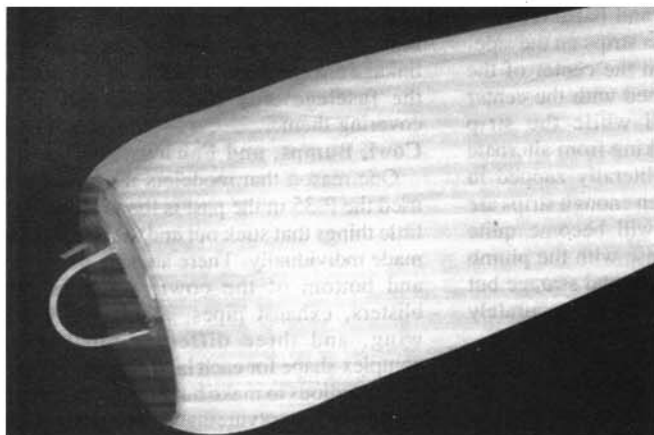


Wing and stab are fitted before finishing fuselage strip planking.

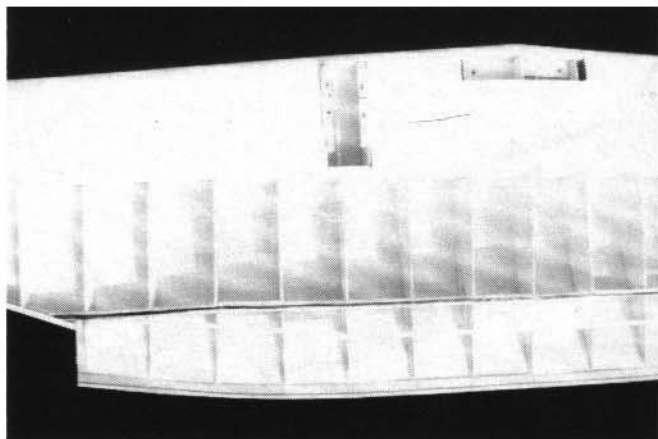
balsa spars full length, complete with dihedral in the outer spars. These spars are positioned after the ribs are glued to the main ply spar. Make sure that you cut holes

in the ribs for the aileron and flap linkage before starting assembly. I forgot and had to do this the hard way. The wing was not built flat on the bench. The top of the wing center section is straight but nothing else is. A constant check for twist was made by spot gluing long 1/4" x 1/4" balsa sticks to the centerline of the outboard ribs. If you look down the end of the wing, you can instantly detect any twist between the sticks on opposite ends of the wing. The same system is used to check the washout at the tips (2½ degrees). A Robart incidence meter checks the amount.

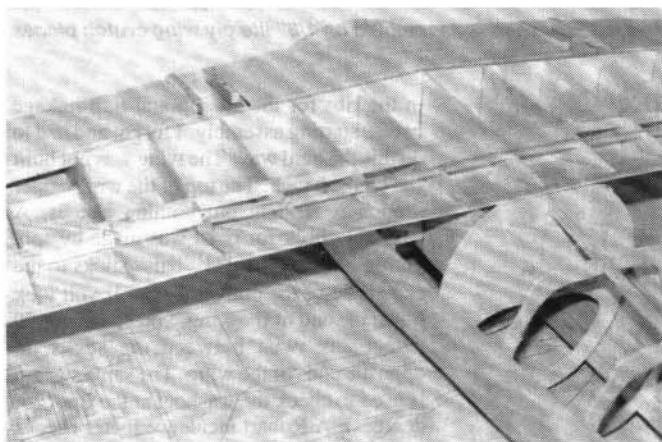
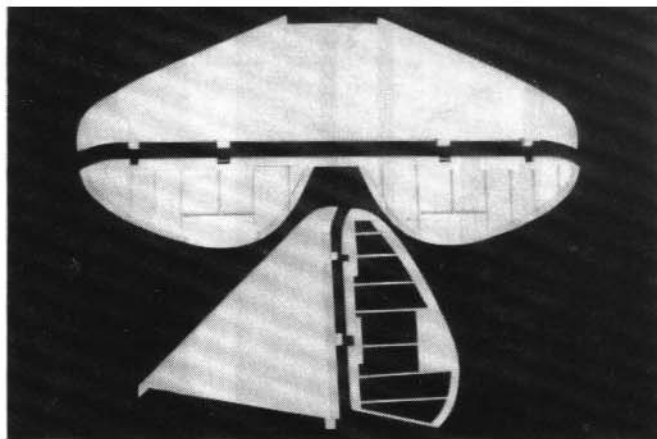
Carbon fiber strips were glued to the top and bottom of the spars before sheeting. With these strips added you can pick up the 22 lb. model by the wingtips without any creaks and groans. The top of the wing is sheeted first (3/32" balsa) to stiffen it before further work. Most of the bottom sheeting is added after the gear, servos, and flap linkage is in place. The flaps are laminated from 1/16" sheet balsa and 1/64" ply. Flaps are then glassed with four ounce cloth for further stiffening. When I started to build the P-35, I had trouble determining if the flaps really did extend back over the fuselage at the center section. You just can't find photos of the plane with the flaps down.



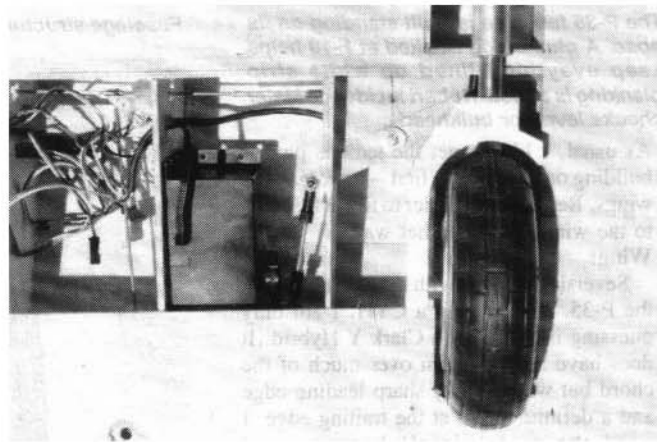
LEFT: Fuselage after planking completed and before cockpit cut out. RIGHT: Cowl, fairings, exhaust pipes, and other odd shaped parts are made from urethane foam covered with 6 oz. glass cloth and resin.



LEFT: Wing ready to install retract, flap, and aileron linkage. Carbon fiber strip along rear spar is visible. **RIGHT:** Tail surface construction is conventional. Stab and fin are covered with 1/16 sheet balsa. All parts were covered with silkspan paper, and doped.

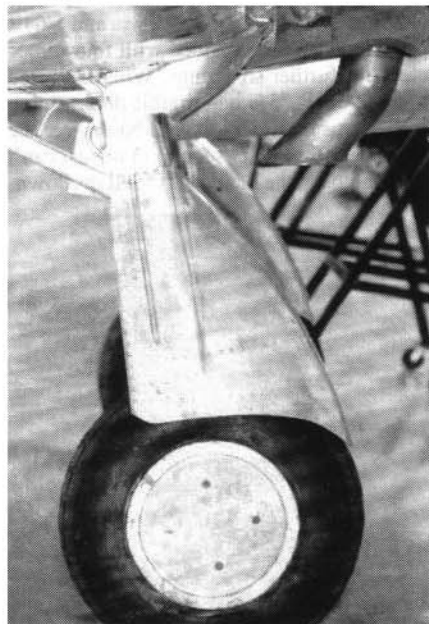


LEFT: Wing fairings were added on prototype after fuselage was planked. Plans show proper shape of fairing at bulkheads. **RIGHT:** Sail winch servo operation of retracts through aluminum bell crank. Up position. Servo bolted to ply reinforcement of rib. Bellcrank mounted on ply.



A visit to the USAF Museum and the secret was out. The P-35 is sitting there in the Museum with the flaps full down and the chord actually is wider at the center as shown on the plans.

Control surfaces on the P-35 were cloth



Landing gear fairings and exhaust stack on P-35A at Weeks Museum.

covered and doped. Balsa ribs are in the scale position on the ailerons for conventional construction — half ribs over 1/16" balsa outline.

Fuselage:

The almost round fuselage of the P-35 does not lend itself to conventional construction. I decided to build it using the same technique worked out for the earlier P-43. The firewall and front formers are glued to the ply wing crutch pieces. The firewall is placed flat on the workbench and the rest of the fuselage is built in a vertical position. The rear formers are aligned with the top and bottom ply and balsa crutches and the 1/4" square balsa strips on the side. A plumb bob hung from the center of the rear former is kept aligned with the center marks on the firewall while the strip planking is started. Working from alternate sides — the strips are literally zapped in place with CA glue. When enough strips are in place, the fuselage will become quite rigid and you can dispense with the plumb bob. The technique may sound strange but you will end up with a very accurately aligned fuselage.

Tail Surfaces:

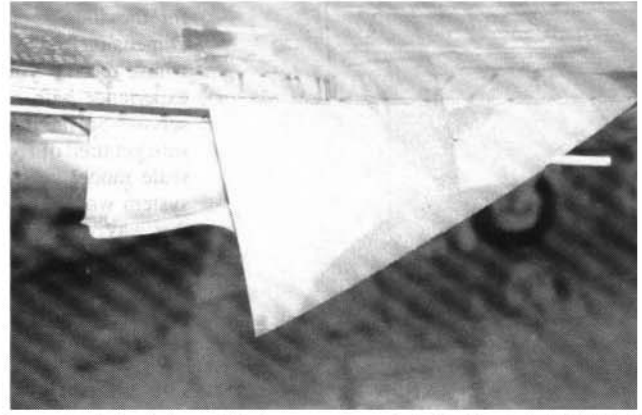
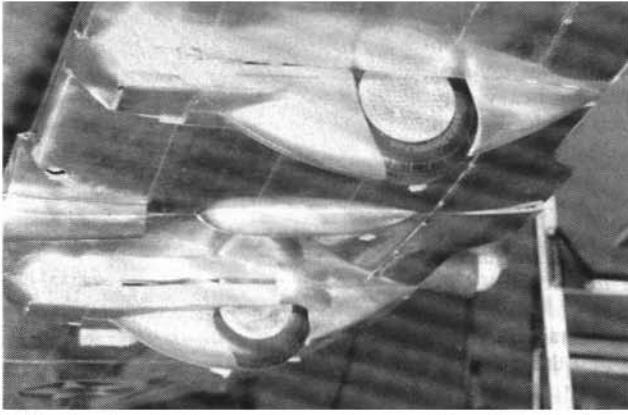
Build these as you would any other model. You don't have to cut ribs. Glue rectangular strips of balsa where the ribs are shown and shape them to a streamlined section with a knife and long sanding

blocks. The stab and fin are sheeted with 1/16" balsa and the elevator and rudder are cloth covered on the original (I used silkspan paper and dope to keep the tail light). Keep the tail surfaces as light as possible as the model is probably going to be tail heavy. In fact, this is the first scale model I have built that required lead weight in the nose. That engine is almost sitting on the wing leading edge.

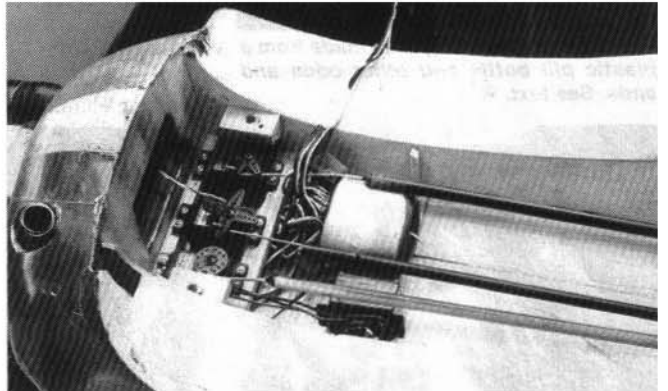
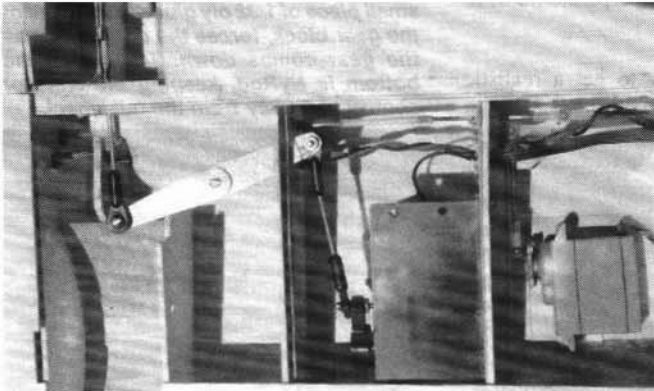
The tail cone is not glued on until the rudder and elevator linkage is complete. The elevator horn is made from brass soldered to a wire bracket. The rudder horn is a nose gear type fixed to a 1/8" wire rudder post with a set screw. The horns and linkage are completely hidden in the rear of the fuselage with the hollow tail cone covering them.

Cowl, Bumps, and Fairings:

One reason that modelers may not have tried the P-35 in the past is the profusion of little things that stick out and that have to be made individually. There are scoops on top and bottom of the cowl, machine gun blisters, exhaust pipes, a pod under the wing, and three different fairings of complex shape for each landing gear. These can be tedious to make but they go fast when carved from polyurethane foam which is then glassed. This is the insulation type foam which cuts like butter yet can be sanded to a smooth accurate surface. It is



LEFT: Wheel and fairings with gear in up position. RIGHT: Close-up photo of original aircraft helps to get model details right. This is the rear wheel fairing under wing.



LEFT: Airtronics sail winch servo position shown with gear in down position. Flap servo to left. RIGHT: Rudder, elevator, and tail wheel retract servos side by side. The throttle servo is mounted flat. Red wires are from the micro switch on the servo, actuating the on-board ignition. Wing hold-down brackets are also shown.

very easy, although messy, to work with. It also accepts polyester resin without any problems.

The cowl is round and the form can be turned on a lathe. The C-2 bulkhead is built right into the cowl and glassed in place. It serves as the cowl mounting surface when the cowl is complete. A couple of 10-32 nylon bolts fix it to the firewall. The rest of the add-ons are simply carved and fitted in place before glassing with polyester resin and cloth. The foam is dug out of the finished product leaving the glass shell.

Canopy:

You do not need a molded glass canopy

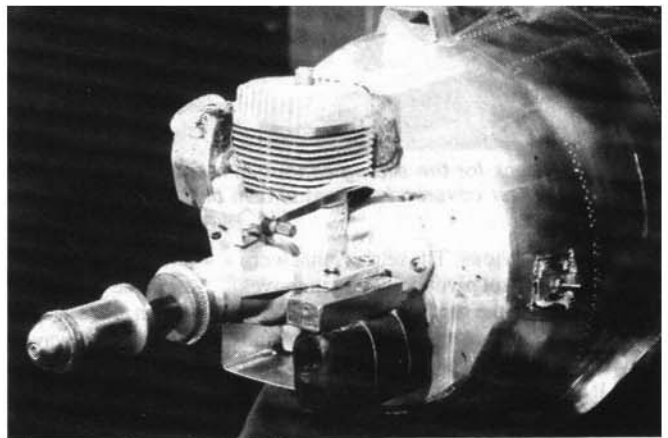
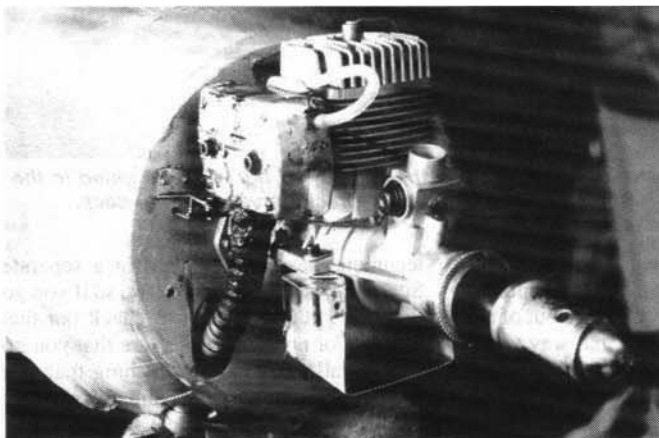
for the P-35. All the glass is either flat or curved in one direction. Simple to make from acrylic sheet. The canopy frame is another matter. You still need to make a foam shape which is then glassed and cut out to form the frame. The sliding rails are made from the structural plastic sold in hobby shops. A Dremel tool will cut a slot in one of the square pieces. Make the slot wide enough to fit the I-beam shaped plastic piece glued to the canopy frame.

Retract Landing Gear:

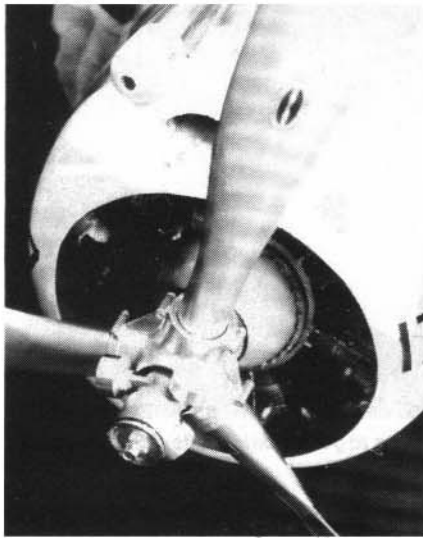
The main wheels on the P-35 retract straight back into the wing with more than half of the wheel sticking out of the wing.

Fairings fixed permanently to the back of the wing and others attached to the gear strut streamline the wheel when it is up. This arrangement is easier to operate than the rotating wheels of the P-36 and P-40. It does require making some extra fairings. All of these are made from urethane foam and glassed. The foam is removed and the glass and resin part remains as the fairing. I could have made a plug and mold to reproduce these but had no desire to go into the kit business. The foam approach goes much faster.

The function of the slip fairing hinged to the front retract fairing may not be



LEFT: A J' TEC exhaust manifold was modified to carry the exhaust out the scale exhaust stack. The dummy engine bolts to the front of the aluminum bracket. RIGHT: The aluminum bracket held the original battery pack and the on-board ignition battery. It was too small for the SR 1200 mA battery, so I packed it in double foam rubber and wired it to the bracket on the outside. No problems so far. The lead weight helps make the already smooth O.S. BGX-1 run even smoother.



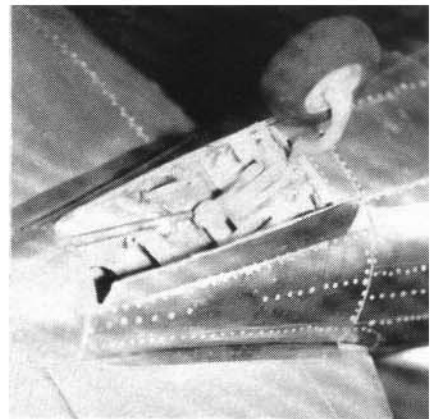
Hamilton standard prop was made from a plastic pill bottle and other odds and ends. See text.

for the linkage are shown on the plans. Dimensions may vary slightly depending on whose retracts you use. This was my first experience with retracts using heavy duty servos. So far it has been good. You can sure get tired of fixing leaks in air hoses as a scale model gets older. Of course, an air system would work fine if you wish to go that way. It would even be a little lighter. More details on this type of gear actuation can be obtained from the Scale Views column in RCM.

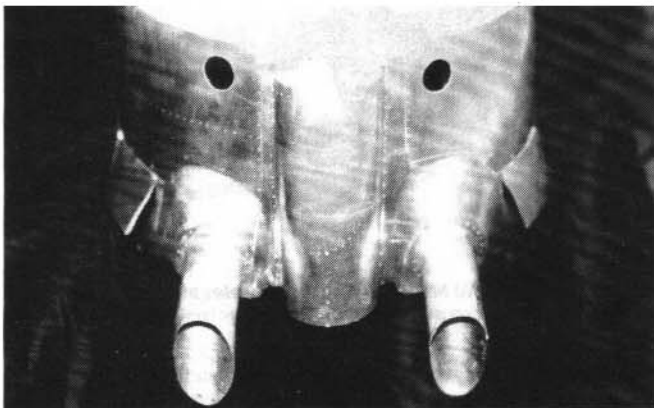
Unlike the later P-43, the tail wheel on the P-35 retracted fully into the fuselage. The plans show a Robart tail wheel installation. I used an old Goldberg nose gear retract that I had on hand. I had to modify the operating lever to get it to fit in the space available. Either type should work fine.

Finishing:

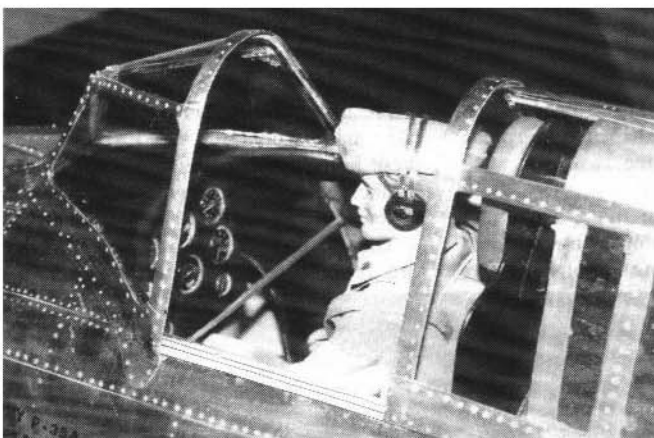
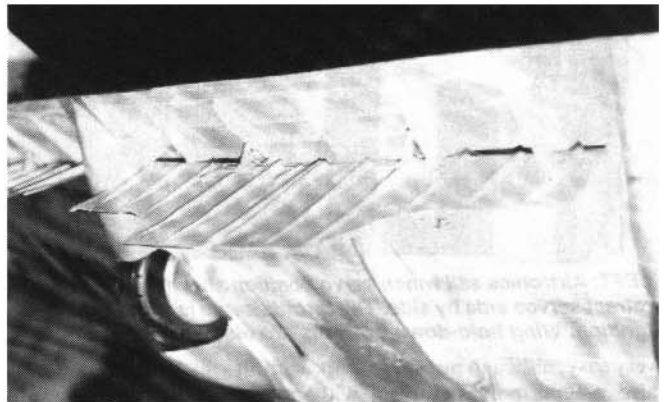
I worried about how to get a realistic looking aluminum finish on the P-35 from



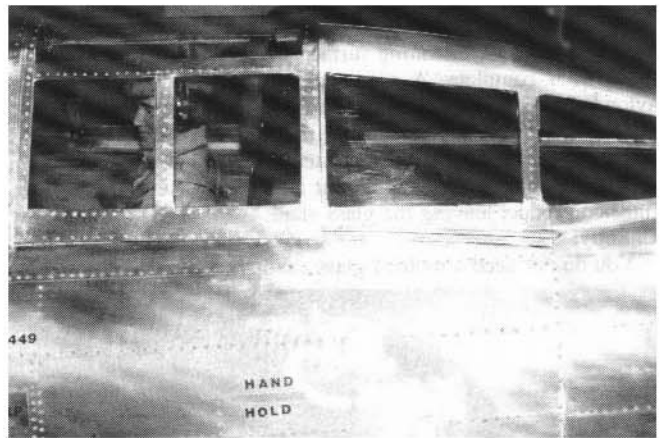
This shows the Goldberg nose gear as a tail wheel. The rubber band closing the doors can be seen (one on each side). The small piece of 1/32 ply glued to the front of the gear block, forces the doors open as the gear comes down. The rod in the bottom is NyRod, keeping the elevator control rod away from the tail wheel.



LEFT: Details of the exhausts and bottom cowl scoop that may not be clear in the drawings. Also shows angle of cowl flaps (10 degrees) RIGHT: Flaps in the full down position. Note the interior ribs, Robart hinges, and control horn position. Flap is split at the center joint.



LEFT: The track for the sliding canopy is made from plastic square stock grooved to hold the plastic "T" bar which is glued to the canopy. Leather covered headrest shown on armor plate. RIGHT: This shows how rear of canopy track curves down at back.



immediately obvious. The retracts that were used have an offset pivot point which moves the strut back as the gear comes up. The slip fairing slides inside the main fairing and provides streamline covering when the gear is up. It is not visible when the gear is down.

The retracts were Christie originals but Impact, Platt, or AMT retracts should work well. All can be modified for electrical operation using sail winch servos. If you decide to try these servos, the dimensions

the day I started drawing the plans. This airplane just has to have a bright aluminum finish to look right. They all came out of the factory that way and stayed that way to the end. Some from Selfridge AB were splashed with a water based camouflage paint for a few weeks during maneuvers in 1941. Hard to document and not very pretty. Aluminum it had to be, but how?

I ended up actually using real aluminum covering for the first time on a model. This

technique has been covered in a separate Scale Views article (Sept. '91), so if you go this way, you will want to check out that article. For now just make sure that you go through all the standard finishing that you would do before the final paint on any scale model. The aluminum sheet goes on last. I used 4 oz. cloth on the front of the fuselage and Dan Parsons 1/2 oz. cloth everywhere else. K&B resin was followed by K&B primer. The .005" thick aluminum applied

in panels did not add as much weight as feared. With a pound of lead in the nose and a 12 oz. steel spinner, the P-35 ended up weighing the same as my old P-43 of similar scale.

If you cover with aluminum panels, you already have the panel lines built in. The aluminum panels on the P-35 were overlapped on the wing and on the fuselage. Rivets are the final step. They had flush Dzus fasteners in 1937 but the rivets were all raised. RC 56 with aluminum powder worked fine. The color must be in the rivets as there is no final paint job over a real aluminum finish. I used #53 Venus G.C.P. Aluminum Extra Brilliant powder from U.S. Bronze Powder Works, Flemington, New Jersey. Innovative Models also has an aluminum powder that should work okay.

Insignia and markings are painted right over the aluminum as on the original. I used Hobbyoxy for this as it is easy to mix the right colors from their paints. I did not use a clear coat over any part of the model. Anything I tried makes the aluminum look like dull paint instead of aluminum.

Scale Prop:

The P-35 used a Hamilton Standard prop without a spinner. The prop hub with its governors sticking out was made from metal and plastic tubing faired with Epoxylite. The blades are balsa and the logo is from Major Decals. The prop is finished aluminum with flat black only on the side towards the pilot.

Engine:

I did not want any part of the engine sticking out of the round cowl so I settled for a model glow engine rather than ignition. The O.S. BGX1 fits perfect as would the ST 2500 and ST 3000. A J'TEC (Tatone) muffler was mounted with the exhaust going down through a flex tube and out the scale exhaust pipe. A 2 oz. surge tank was mounted in series with the large 24 oz. main tank. Exhaust pressure keeps this tank full at all times and eliminates foaming or other problems from fuel sloshing in the main tank. An 18 x 10 Zinger turns well with the BGX1 and you definitely have to throttle back to achieve scale speed with this combination.

Flying:

After putting the servos as far forward as possible and mounting the 1200 mA battery pack forward of the firewall (well padded), the model still seemed tail heavy. I put the C.G. at 25% to be on the safe side (4.75" back at the center section). I still had to add 3/4 lbs. of lead up front. This was bolted to the engine lugs. You do not use the lugs with the radial mount that comes with the engine. A heavy steel spinner also helped.

I finished the P-35 just barely in time for the Top Gun Invitational Scale Tournament in May '91 and I had to fly it first. The first flight on an original design is always anticipated with a question mark. Did I do everything right? Did the original have some bad flight characteristic? Is the aluminum sheeting going to cause radio problems? Did I forget anything (important



The antenna insulator and scoop are shown.

with my record)? As it turned out everything went fine, the model tracks good in spite of the narrow gear — retracts worked with no problem — it is stable in the air and settles in nicely for landing with 45 degrees of flaps. A second flight went the same. The next four flights were at Top Gun. Great place to practice!

The first one of you to build an R/C model of the P-35 will have the second one that I know of that is flying. You will find that the old-timers all know the airplane. The younger guys know it is too short so they won't embarrass themselves by calling it a P-47 (like they did my P-43). And no — I didn't fly the original P-35 — it was the later P-43. I finished high school in 1937, the year the P-35 went operational. Maybe Col. Bob Thacker flew it? □

**From
RCModeler
June 1992**

P-35

Designed By:
Col. Art Johnson
TYPE AIRCRAFT

Exact Scale

WINGSPAN

86.4 Inches

WING CHORD

16.8 Inches (Mean Avg.)

TOTAL WING AREA

1293 Sq. In.

WING LOCATION

Low Wing

AIRFOIL

Seversky CYH (scale)

WING PLANFORM

Elliptical

DIHEDRAL, EACH TIP

4.25 Inches

OVERALL FUSELAGE LENGTH

57 Inches

RADIO COMPARTMENT SIZE

Ample Room

STABILIZER SPAN

27.5 Inches

STABILIZER CHORD (incl. elev.)

10.3 Inches (Mean Avg.)

STABILIZER AREA

235.5 Sq. Inches

STAB AIRFOIL SECTION

Symmetrical

STABILIZER LOCATION

Center Rear Fuselage

VERTICAL FIN HEIGHT

10.6 Inches

VERTICAL FIN WIDTH (incl. rud.)

12.6 Inches (Mean Avg.)

ENGINE SIZE

1.5-2.5 Cu. In.

FUEL TANK SIZE

(1) 2 Oz., (1) 24 Oz.

LANDING GEAR

Retractable Conventional

REC. NO. OF CHANNELS

7

CONTROL FUNCTIONS

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

Ret., Flap, Bomb Drop

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa & Ply

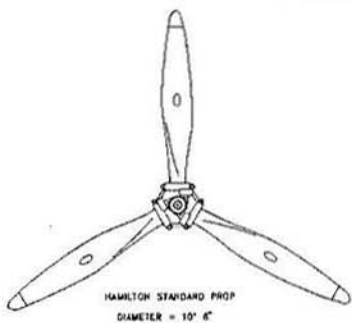
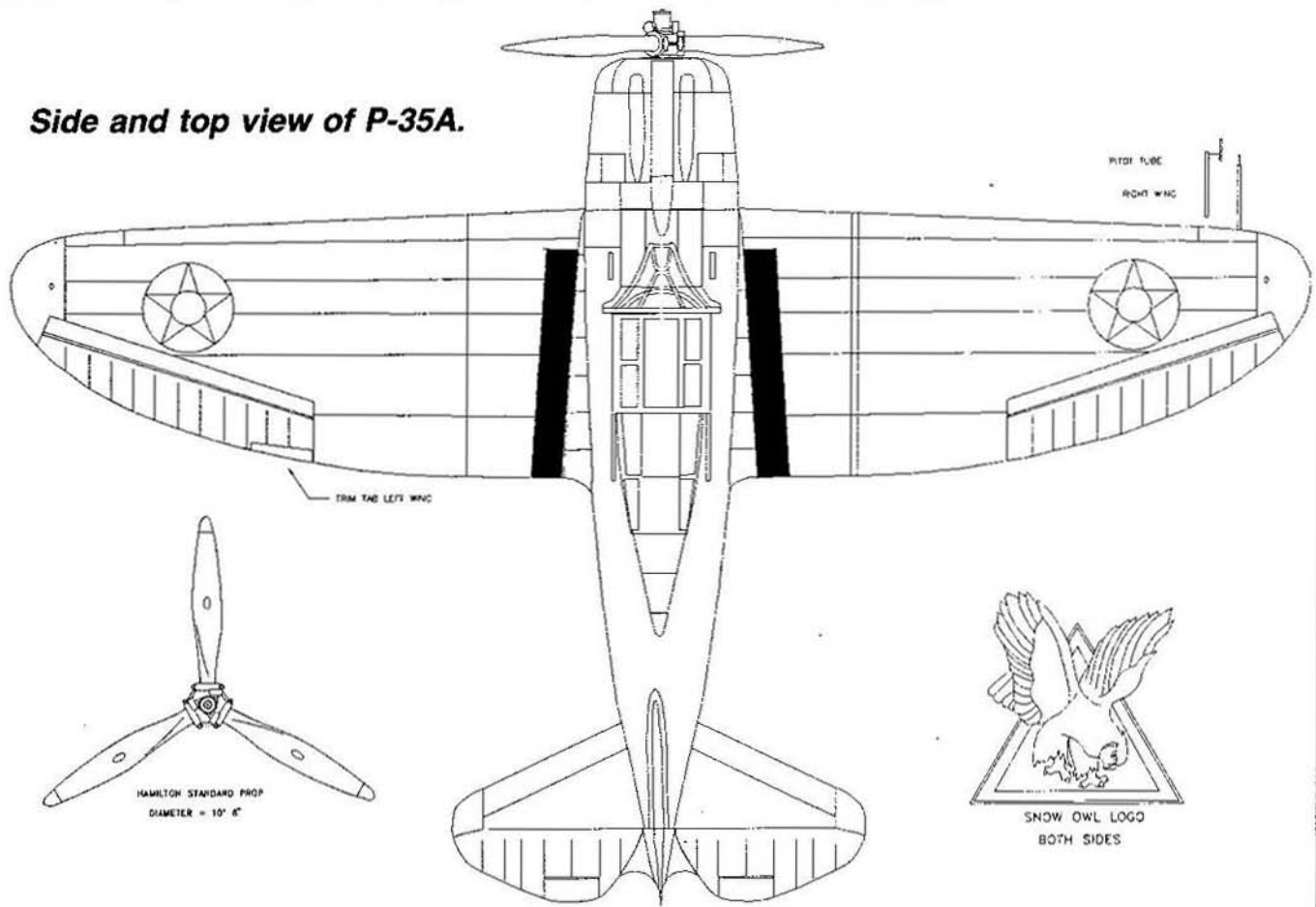
Wing Balsa & Ply

Empennage Balsa

Wt. Ready To Fly 352 Ozs. (22 Lbs)

Wing Loading 39.2 Oz./Sq. Ft.

Side and top view of P-35A.



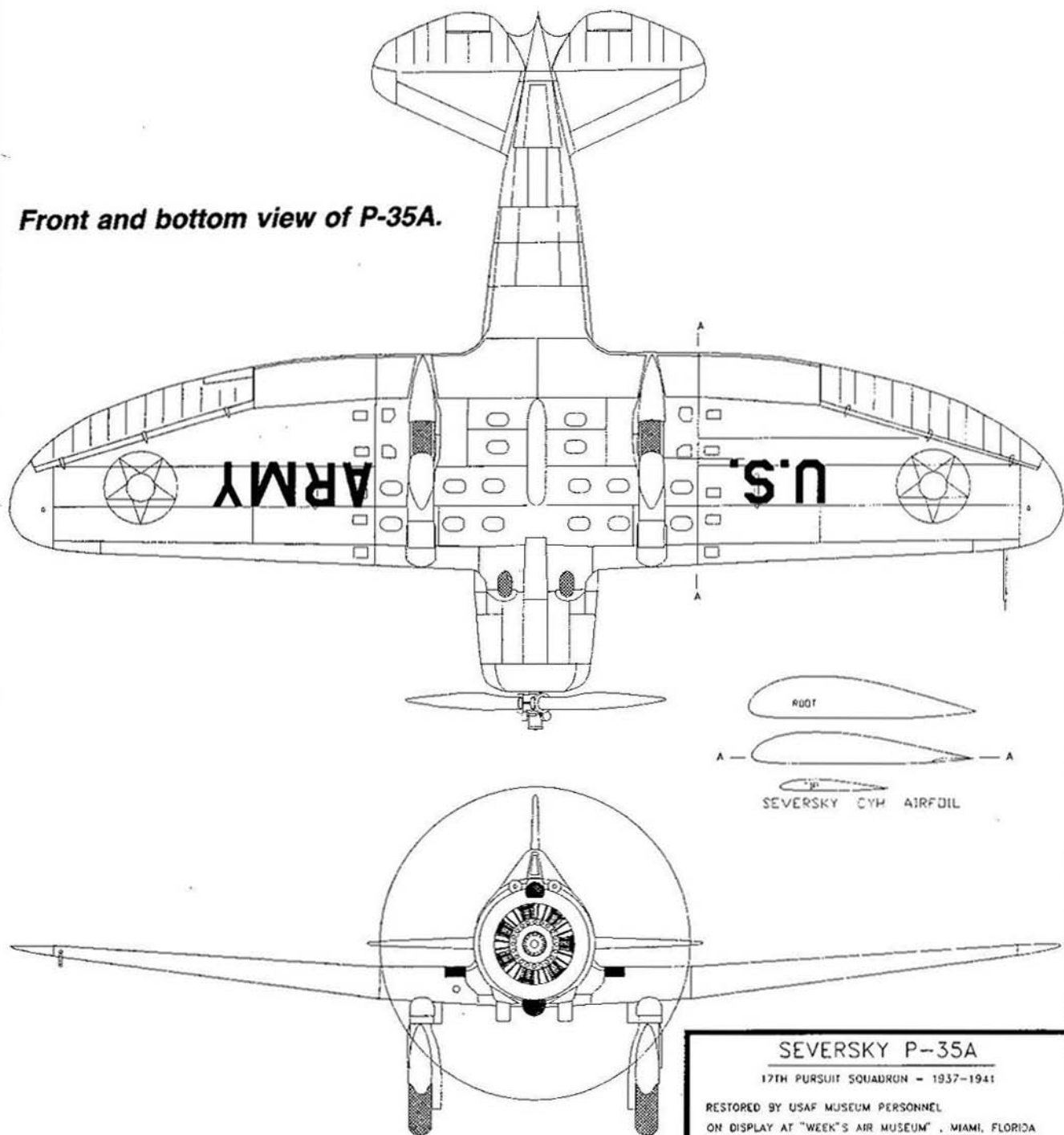
U. S. ARMY P-35A
AIR CORPS SER. NO. 41-17448

SEVERSKY P-35A

17TH PURSUIT SQUADRON - 1937-1941

RESTORED BY USAF MUSEUM PERSONNEL
ON DISPLAY AT "WEEK'S AIR MUSEUM", MIAMI, FLORIDA
WINGSPAN = 36'
PRATT & WHITNEY R-1830 "WASH" ENGINE - 550 HP

Front and bottom view of P-35A.



SCALE 0 5 10 FT.

SEVERSKY P-35A

17TH PURSUIT SQUADRON - 1937-1941

RESTORED BY USAF MUSEUM PERSONNEL
ON DISPLAY AT "WEEK'S AIR MUSEUM", MIAMI, FLORIDA
WINGSPAN = 36'

PRATT & WHITNEY R-1830 "WASP" ENGINE - 850 HP