NOIX Models Curtiss CR-2 - Kit review
Anders Bruun

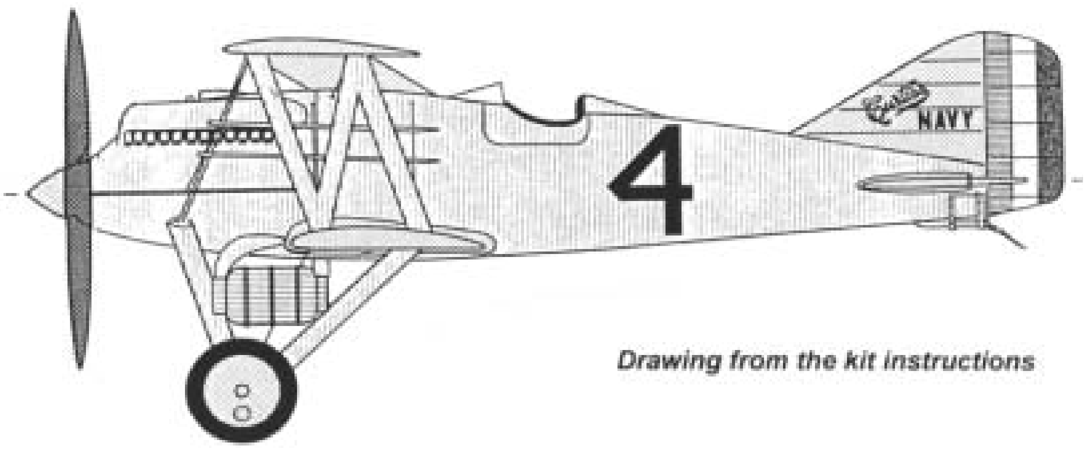
NOIX Models "Men and Machine Club" Kit No. 48-21 "Curtiss CR-2". 1/48 kit, containing 11 resin parts, 20 metal parts, decals and a big two-page instruction sheet in Japanese with drawings. Available from **NOIX Models, 366-5, Miyamae, Fuzisawa, Kanagawa, 251-0014, Japan (E-mail: izumi@n.email.ne.jp)** and a couple of mail order houses.

The plane

First a little terminology - the designations of the Curtiss racers are a bit confused in the literature. The kit depicts US Navy serial number A-6081, the 1921 Pulitzer Trophy winner. According to the Bowers book it was actually at that time known simply as the Curtiss CR (for Curtiss Racer) - the CR-1 and CR-2 designations were only introduced in March 1922. A-6080 was always the CR-1 and A-6081 was always the CR-2, regardless of whether they had Lamblin radiators or wing surface radiators. They can be identified by the outline of the cowling panels below the exhausts, rounded on the CR-1 and square on the CR-2, but there were also a couple of other detail differences.

A-6081 was one of two almost identical wooden construction racers ordered from Curtiss by the US Navy for the 1921 Pulitzer race, which was to be held at Omaha, Nebraska on November 3rd. According to internal Curtiss' terminology they were called Model 23. The planes were powered by Curtiss' latest V-12, the low-revving direct-drive CD-12 of 1145 cubic inches (18.8 litres), which delivered a maximum 420 hp at 2180 rpm. For the 1921 Pulitzer race it burned fuel containing 50% benzol and turned a wooden Curtiss propeller.

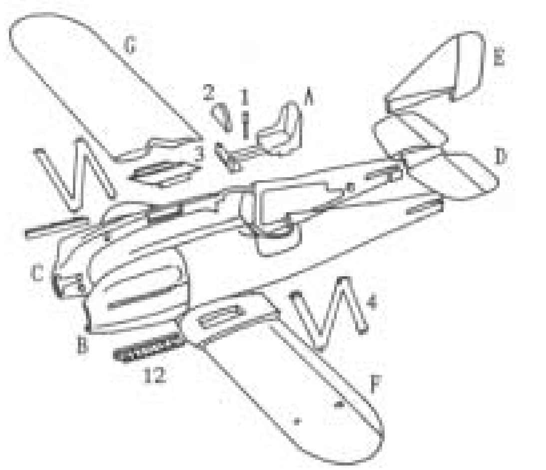
Eventually both the Army and the Navy decided to withdraw from the 1921 Pulitzer Trophy race, but Curtiss managed to "borrow" one plane back, so that it could participate as a private entry. It was flown by the flamboyant test pilot Bert Acosta, who easily won, despite flying high and wide, fighting an ill-handling

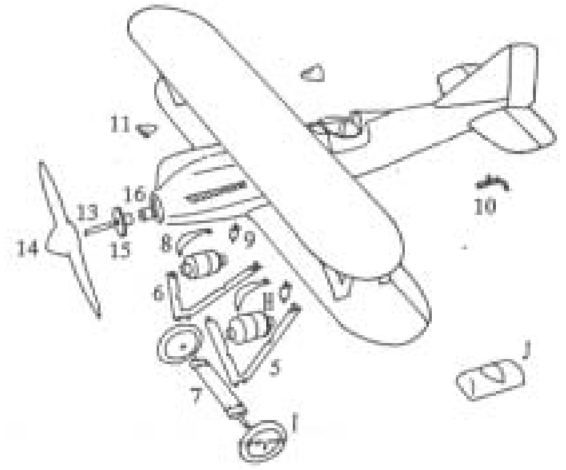


Drawing from the kit instructions

plane after two flying wires snapped in the first turn. He covered the five laps of the triangular 31.07 mile (50 km) course in 52 minutes 8.4 seconds, giving an average speed of 176.750 mph (284.36 km/h), an unofficial world closed-course record. His prize money was $3000. Four planes finished the race - second place was won by Clarence Coombs in the Curtiss-Cox "Cactus Kitten" triplane at 170.336 mph.

A couple of weeks later Acosta flew the plane at 184.4 mph (297.5 km/h) over a measured 1 km course, not enough to beat the world speed record, which was held at 330.275 km/h by the French Nieuport-Delage Sesquiplane since less than two months earlier. The CR-2 was later modified with top wing surface radiators and took a third place in the 1922 Pulitzer race, flown by Harold Brow. It was then equipped with floats and became one of the CR-3s, in fact the example in which David Rittenhouse won the 1923 Schneider Trophy and George Cuddihy beat the seaplane world speed record.





The kit

The kit is of conventional configuration, with vertically split fuselage halves. The interior comprises three parts, an instrument panel, a control stick and a one-piece seat-rudder pedal assembly. These parts are adequate, but a throttle box and a seat harness might be added. The fuselage halves of my kit were slightly warped, but the very smooth, soft resin of the kit is easy to bend to shape after holding it under the hot-water tap. The contact surfaces should be lightly sanded before being joined and there are some pouring gates that need to be removed - this goes for all the parts of the kit.

The one-piece horizontal tail slips into a slit in the fuselage, while the verticals fits into a slot. These parts need to be trimmed a little to fit perfectly, and a small amount of filler will be necessary. The one-piece lower wing might need bending to shape - it should have 2 degrees of dihedral, while the top wing should be flat. In my kit both were slightly droopy. Some filler will be needed around the wing roots. The one-piece wing "N" struts and the single cabane pillar are next - they are cleanly cast in metal. I wish all biplanes could have as simple strut arrangements…

This is probably the best time to paint the model. The paint scheme given in the kit - grey fuselage and silver flying surfaces - is correct according to the Monogram book and according to my interpretation of photos, but a couple of sources say that the tail surfaces should be yellow. The decals cover the #4 Pulitzer version and a post-race version without racing numbers. The decals are well-printed and thin, but the blue colour of the national insignia is perhaps a bit too light. However, I am not sure that the plane carried any national insignia on the top wings. I have only seen three photos of the plane in 1921 Pulitzer markings. In one of them I think the wing markings should be visible, but they are not. However, I am not sure - feedback wanted! Note that the paint finish should be almost dead flat - this was not one of the waxed and polished jobs!

The trailing edges of the top wing should be thinned a little to match the superb trailing edge of the lower wing. The landing gear is cleanly cast in metal, with resin wheels and Lamblin "lobster pot" radiators. The slots in the legs where the radiators sit must be filed to size before the legs are attached to the fuselage, and all location pins must be shortened - or deeper holes drilled. The radiators themselves have a slight joint line, which could be hidden be aligning it with the landing gear legs. The front and rear openings of the radiators should be drilled out.

Then it is time for the final details. The duct fairings for the radiator look heavy, but they were surprisingly substantial on the real plane too. The 24 exhaust pipes are perfectly cast in two sets of twelve, but each pipe could have its end drilled. The kit supplies clear sheet for the simple curved windshield and a plug for forming it, which also serves as template for its actual shape. The propeller, tail skid and carburettor scoop finishes the model.

A couple of details are missing from the kit and its drawings. Rudder horns and control wires should be fitted at a level immediately below the stabiliser fairings. There should be a little filler cap (?) in front of the carburettor scoop - it is visible in the kit drawings. The kit drawings do not show the tailplane rigging. Wires should run from the rear spar of the fin, at the level of the top rib, to the stabiliser rear spar, at the second rib from the tip, to the bottom of the fuselage at the rudder post. The flying wires should be double - the rear set runs between the rear spars, from the bottom wing root to the top wing "N" strut. There were funny-looking oval flat fairings around the turnbuckles at the outer ends of the landing and flying wires, but I have no good idea about how to simulate them, so it is perhaps best not to try. I think the plane only carried one of the long rods on each side connecting the flying and landing wires - at least I can't see the inner rods in photos taken at the Pulitzer race.

The kit is a bit undersize, particularly in length (around 4 mm), but the shape and proportions look so good that I think few people will care. A couple of panel lines could be added around the front of the cowling, but otherwise the kit parts look as smooth as the original plane. The fabric detail on the tail surfaces is perhaps a bit flat, but perfectly adequate. The other panel lines are recessed, discreet and sharp. The lower wing panels appear to have a very slight sweepback, but I think the dihedral will hide it.

Conclusion

Production-wise this a superb kit. Good resin, smooth and without any bubbles whatsoever, good metal, cleanly cast with invisible mould lines, and good decals - if I could read Japanese I would probably tell you that the instruction sheet is good too! The main parts are individually packed in plastic bags in a sturdy box that will probably survive most post offices. The minor inaccuracies are in my mind not worth bothering about. Highly recommended - despite the high price!

References

- **Thomas G. Foxworth: "The Speed Seekers"** (Haynes, 1979). One photo of #4
- **John M. Elliott: "The Official Monogram US Navy and US Marine Corps Aircraft Color Guide, Volume 1, 1911-1939"** (Monogram Aviation Publications, 1987). Two photos of #4
- **J. M. Robinson: "Curtiss Navy Racers CR 1, 2 and 3"** (Nexus Plan Pack 2755, reprint from Aero Modeller, May 1962)
- **"Aircraft Archive - Famous Racing and Aerobatic Planes"** (Argus Books, 1989). Same Robinson drawings as above
- **William T. Larkins: "U.S. Navy Aircraft 1921-1941, U.S. Marine Corps Aircraft 1914-1959"** (Orion Books, 1988). One photo of the post-race version featured in the kit
- **Peter M. Bowers: "Curtiss Aircraft 1907-1947"** (Putnam, 1979)

A big thanks to **Sugimoto Izumi** of **NOIX Models** for the review example!

NOIX Models Curtiss R3C-1 - Kit review

Anders Bruun

NOIX Models "Men and Machine Club" Kit No. 48-22 "Curtiss R3C-1". 1/48 kit, containing 9 resin parts, 15 metal parts, vacform windshield (plus a spare), decals and a big two-page instruction sheet in Japanese with drawings. Available from **NOIX Models, 366-5, Miyamae, Fuzisawa, Kanagawa, 251-0014, Japan (E-mail: izumi@n.email.ne.jp)** and a couple of mail order houses.

The plane

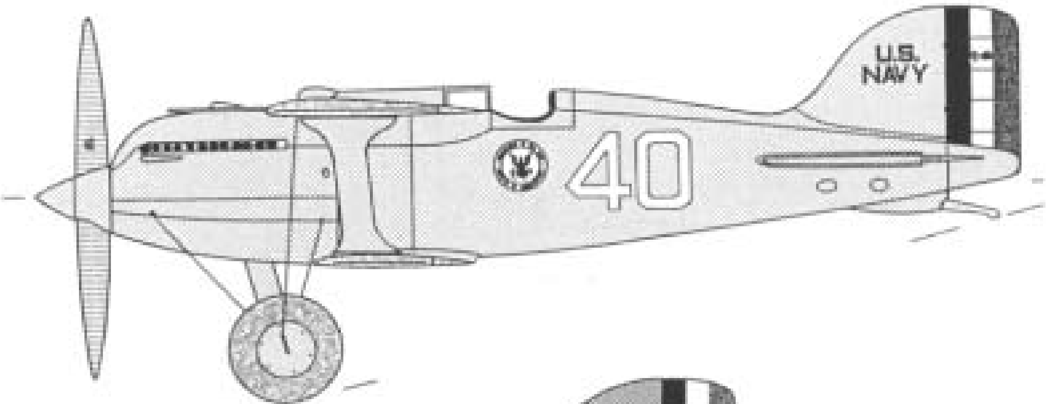
The R3C-1 was the last in the successful line of Curtiss landplane racers. It was a development of the previous R2C-1 - externally they were very similar, but the R3C-2 had a thinner wing profile and improved light-weight construction. The engine was also new, although it too was a development of earlier constructions. It was the Curtiss V-1400, a direct-drive V-12 with a displacement of exactly 1400 cubic inches (22.9 litres). It developed a maximum of 619 hp at 2525 rpm and drove a 8'4" (2.54 m) diameter fixed-pitch forged aluminium Curtiss-Reed propeller.

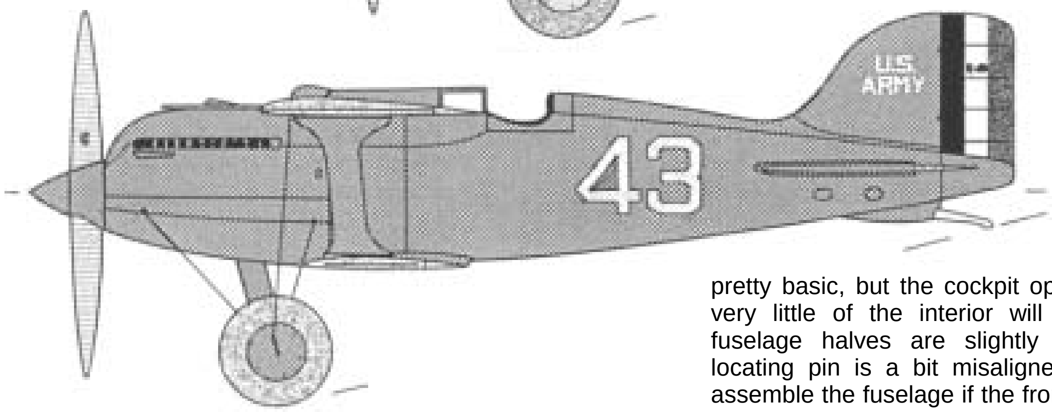
Three planes were built on a joint Army/Navy program. Through their careers they were known by the Navy R3C designations - they never had any Army "R-" designations. The first plane was A-6978, which was used for common Army/Navy development work and was soon converted into the first R3C-2 floatplane racer. The second was A-6979, the Navy plane, and the third was the Army plane, which was later taken over by the Navy and numbered A-7054.

The 1925 Pulitzer Trophy race was held at Mitchel Field, Long Island, on October 12th, after being postponed two days because of rain and high winds. It consisted of two heats, a first "gold division" heat between the Army/Navy R3C-1s, and a second heat for standard Army fighters. The distance was four laps of a triangular 50 km (31.07 miles) course. Lt Alford Williams in the Navy #40 took off first and 1/Lt. Cyris Bettis in the Army #43 followed two minutes later. Cy Bettis took it easy in the early running and improved his speed during the race, winning at a somewhat disappointing 248.975 mph (400.687 km/h), while the performance of #40 decreased during the race to a final 241.695 mph (388.971 km/h) - slower than Williams' winning speed in the 1923 race in the Curtiss R2C-1. Williams was later blamed for having treated the engine of his plane too roughly with a lot of full-throttle test flying, instead of breaking it in gently. Price money was $2000 for first place and $1000 for second.

After the race the participating planes were quickly converted to floatplanes in preparation for the 1925 Schneider Trophy race, which was held only two weeks later in Baltimore, Maryland. That was another success for the US Army, with Jimmy Doolittle in A-7054 winning. The three R3Cs were back for the 1926 Schneider Trophy, with two of them re-engined with new Curtiss and Packard engines. The US effort that year was hampered by bad luck and some incompetence, but A-7054 took a second place after Mario de Bernardi's Macchi M.39.

Drawings from the kit instructions





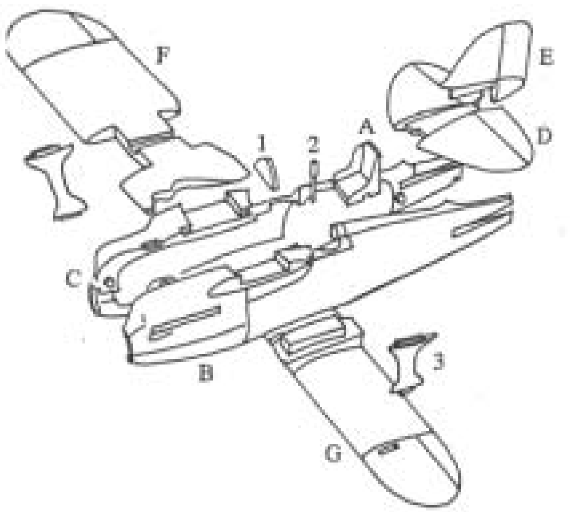
The performance of the R3C-1 was a bit disappointing. It had probably reached the end of the development potential of its technology. It would take something else than fixed-gear biplanes with normally aspirated, direct drive engines and fixed-pitch propellers to achieve a significant increase in speeds. The R3Cs signalled the end of US military spending on development of high-tech racing airplanes. They also signalled the end of Pulitzer Trophy races - the 1925 event was the last.

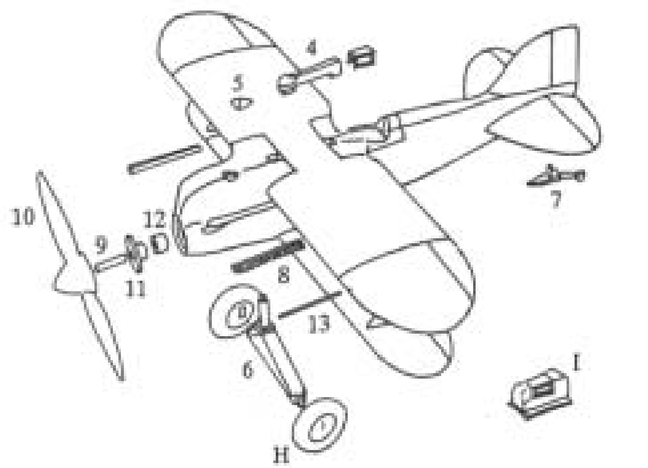
The kit

Despite the obvious similarities between the R3C-1 and the R3C-2 Schneider Trophy racer released earlier by NOIX, this kit is completely different - hardly a single part is unchanged. This kit is more conventionally subdivided and contains more parts.

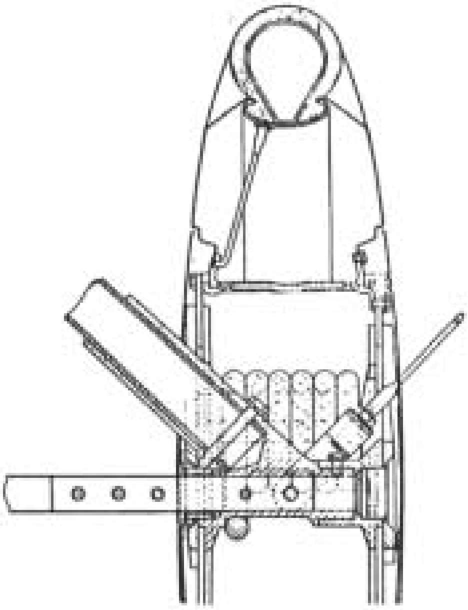
The fuselage is separated into right and left halves. The interior comprises a seat, instrument panel and a stick - pretty basic, but the cockpit opening is very small and very little of the interior will be seen anyway. The fuselage halves are slightly warped and the front locating pin is a bit misaligned - it will be easier to assemble the fuselage if the front pin is cut off. A couple of resin lumps in the lower wing cut-out and the cockpit opening have to be removed.

The horizontal tail surfaces slide into a slit in the fuselage, and the verticals fit into a slot between the fuselage halves. They need some adjustment, but can be assembled without any filler. The top wing has a narrow centre section which bridges the two wing panels and is intended to fit into a slot in the top fuselage, Unfortunately it doesn't fit very well - it will leave several gaps, including two across the top fuselage, that will need to be filled and sanded. The trailing edges of the top wings do not match the root fairings - the wings have to be thinned in order to fit. The lower wing root needs some trimming, but fits pretty well. Both wings should be flat (zero dihedral), but on my example they were a bit droopy. The inter-wing I-struts are beautiful metal castings.





The landing gear consists of a sturdy metal triangle with a substantial locating pin for insertion into a hole in the fuselage. This is good - a stiff, strong structure is essential, since several rigging wires are attached to the landing gear and the wheel hub. The wheels had a large-diameter stationary internally sprung hub, which accounts for their unusual profile, correctly captured by the kit. The tyres were of normal dimensions, but were faired into the wheels with fabric, which can be seen by the wrinkles that are obvious in many photos.



Section through the internally sprung wheel hubs of the Curtiss R2C and R3C planes. Note the fabric fairing between the wheel and the tyre.

Other details include pitot tube, tail skid, carburettor scoop (which needs to be hollowed out) and the fairing between the radiator header tank and the windshield. The windscreen itself is vacformed - sharp and clear. There should be one little streamline-shaped bulge, perhaps 2 mm long, on each side of the top fuselage immediately beside the fairing, in front of the clear part of the windscreen. Only #40 had removable panels around the cockpit, so if you build #43 the panel lines around the cockpit should be filled. The access panels below the stabiliser and the hole in the left cowling (for the starter crank?) could be added - they are indicated in the kit drawings. The exhausts are beautifully cast with individual stacks, but I am not sure that this is correct. In photos it looks like there should be one long shroud on each side, rounded at the front and pointed at the rear, framing zero-length ports - please contact me if you have sharp photos!

The kit drawings do not show all the rigging details:

- A single flying wire between the lower wing rear spar at the root and the upper wing rear spar inboard of the I-strut.
- A single landing wire between the vertical panel line across the upper wing fairing, at the level of the top of the exhaust cut-outs, and the lower wing at the centre of the base of the I-strut.
- The flying and landing wires were connected by a rod parallel to the line of flight.
- A single wire between the wheel hub and the top wing at the front of the I-strut.
- This landing gear wire was connected with the landing wire by another rod.

The decal sheet covers both the black and gold Army #43 and the Navy #40. It is superb, well printed and thin. Especially the blue and gold "Bureau of Aeronautics" badges of #40 are incredibly good.

The radiators are simulated by fine-line striped gold decals which are intended to be applied over a dull brass base colour. I think this is a good compromise - 1/48 is a difficult scale for corrugated surface radiators. In 1/72 any effort at reproducing the corrugations would be overscale, and in 1/32 surface detail would be necessary, but 1/48 is somewhere between. I have not tried the radiator decals, but I think it is a good way of simulating the detail without being obviously overscale. Note that the decals are slightly too wide, and that one or two lines should be trimmed off at the inner ends before they are applied. It appears from photos that the corrugations on the top and bottom surfaces met at the leading edge, but did not wrap around. The corrugations did not reach the trailing edge, so the decals should be trimmed to end around half a millimetre from the trailing edge.

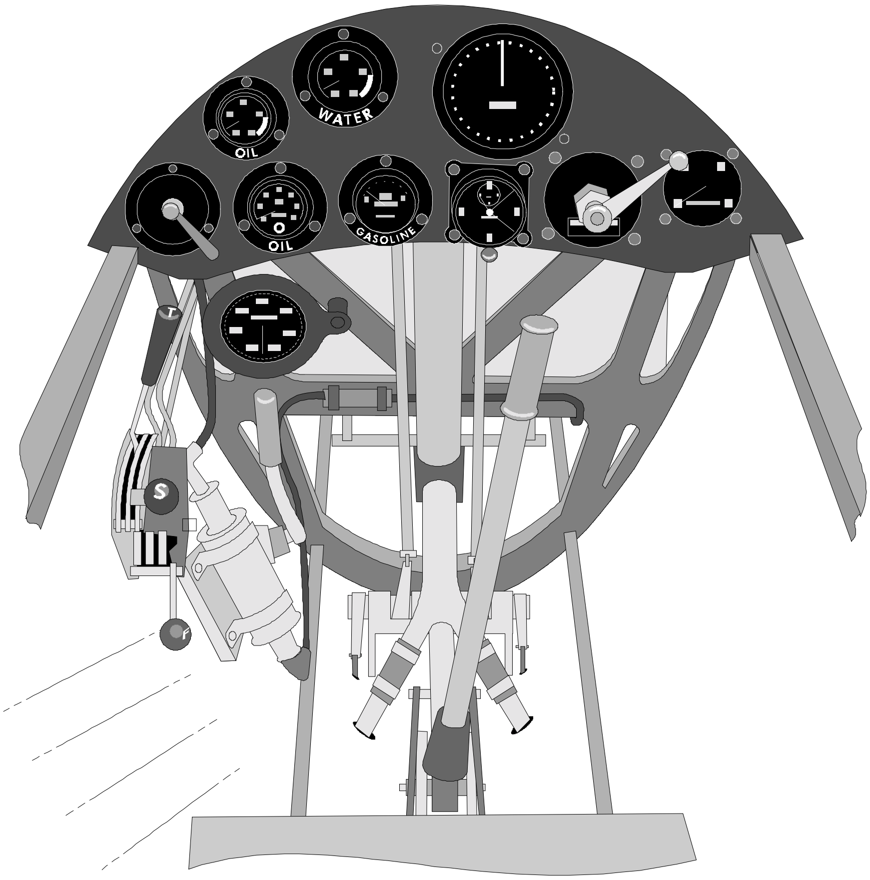
I am not so sure about the paint scheme of the #40 Navy machine. The kit instructions say that it should be grey. I have not seen this anywhere else, and both Kinert and Foxworth say that it was blue. The earlier Navy R2C-1s were blue, but they seem to look a bit darker than the R3C-1 in photos - which can of course be the effect of different films and lighting conditions. Feedback wanted! Whichever way, the finish of both planes should be satin-smooth, not waxed and polished. The aluminium propellers were also matt. Photos seem to indicate that the front of the radiator header tank fairing should have a different colour than the rest of the plane - probably natural brass.

The kit is a bit undersize, around 2 - 3 %, especially the fuselage and the lower wing. However, the shapes and proportions are right and the model certainly looks like the original plane.

Conclusion

Compared to other NOIX kits this one will need a little extra work, mainly due to the bad fit of the top wing. I must admit I preferred the solution of the R3C-2 kit, were the top wing and the top cowling formed one large part, which was joined to a one-piece fuselage. Nevertheless, no experienced builder should have any problem building it, and the shoulder-wing configuration and the I-struts simplify construction compared to most biplanes.

As usual the resin and metal castings are of absolute top quality, and the decal sheet is nothing short of perfect.



The cockpit of the R3C-1

The vertical coolant return pipe from the top wings is positioned in front of the instrument panel. It joins the return pipes from the wings, which are attached to the inverted Y-shaped pipes. The rods beside the vertical pipe are the top wing aileron push/pull rods. To the left of the pilot are a throttle quadrant and a fuel wobble pump. The fuel tank is visible behind the instrument panel and the rudder pedals are half hidden by the fuselage former. The lines on the left side indicate the clearly visible diagonal fuselage planking. The seat is visible at the bottom of the drawing.

Colours: The instrument panel, all instrument faces and the side of the throttle quadrant are black. All the fuselage structure and the cockpit walls are natural wood. The coolant pipes, the controls and the wobble pump are natural metal of different shades. The seat appears to be natural wood.

Drawing by Anders Bruun

References

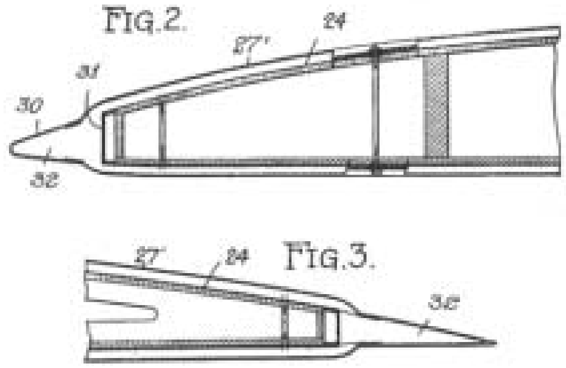
- **Thomas G. Foxworth: "The Speed Seekers"** (Haynes, 1979). Four photos of #43, three photos of #40, plus cockpit, engine and wing details
- Drawings by **Joseph Nieto** from **Model Airplane News, May 1952,** available from Air Age Publications
- **Reed Kinert: "Racing Planes and Air Races, Volume II"** (Aero Publishers, 1967). Three photos of #43, one photo of #40, engine details.
- **William T. Larkins: "U.S. Navy Aircraft 1921-1941, U.S. Marine Corps Aircraft 1914-1959"** (Orion Books, 1988). One photo of #40
- **Peter M. Bowers: "Curtiss Aircraft 1907-1947"** (Putnam, 1979). One photo of #43
- **Don Berliner: "World Wide Directory of Racing Airplanes, Volume 1"** (Aviation Publishing, 1997). One photo of #43, one photo of #40
- **Joseph E. Hood: "The Sky Racers"** (Grosset & Dunlap, 1969). One photo of #43
- **Joe Christy: "Racing Planes Guide"** (Sports Car Press, 1963). One photo of #43

A big thanks to **Sugimoto Izumi** of **NOIX Models** for the review example!

The Curtiss Wing Radiators - How Did They Work?
Anders Bruun

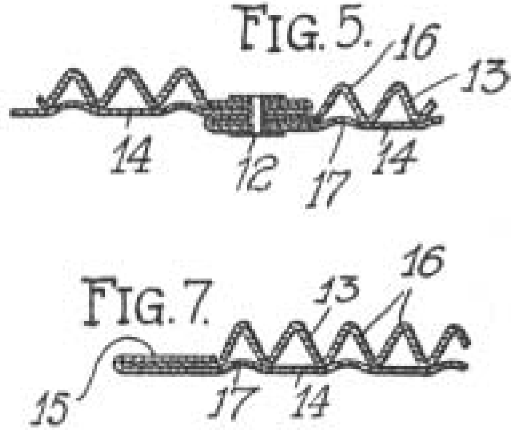
Surface radiators were one of the aerodynamic developments of the early 1920s. Several companies developed similar systems, for example Nieuport-Astra and Bee-Line, before the final constructions by Supermarine and Macchi. Curtiss were among the pioneers, and to my knowledge they were the only ones to get a volume production order for surface-cooled airplanes, the PW-8 fighters. How did these radiators work, and how were they built? Curtiss patent documents give some of the answers. Between May 1921 and October 1923 Curtiss, through their employees Arthur Thurston, Harvey Mummert, Joseph Meade and William Wait Jr. filed at least six U.S. patent applications for different features of the systems.

The systems worked by pumping cooling water from the engine to a header tube which formed the actual wing leading edge. The water then flowed rearwards along the top and bottom wing surfaces in channels formed between two corrugated brass panels that were soldered together along the corrugations. The water was then gathered in another header which formed the trailing edge of the wing. The figures below show the leading and trailing edges - probably those of the Army R-6 racer, which differed slightly from those of the R2C and later versions. The radiator elements of all the racers were held down by tie-rods passing through the wings, although different systems were also developed.



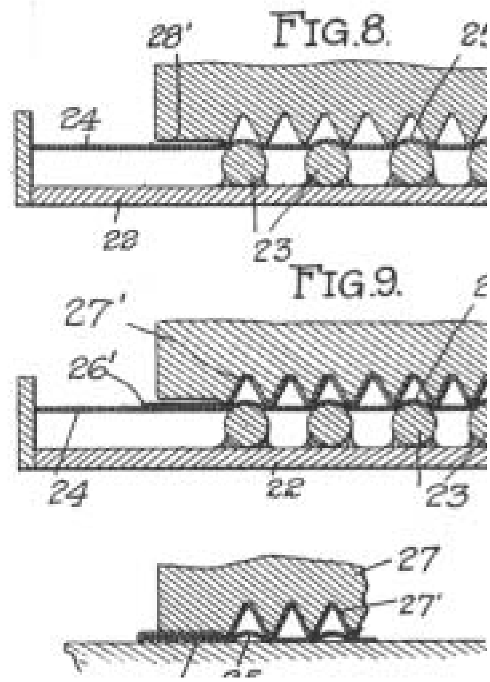
Figures 2 and 3 of U.S. Patent 1682204

The radiator surfaces were formed by strips of double walled corrugated brass sheeting. The profile of the corrugated elements, and the way they were overlapped at the joints, can be seen from the following figures:



Figures 5 and 7 from U.S Patent No. 1682204

The elements were produced by first lightly corrugating the bottom sheet by pressing it over a bed plate with a roller. This light corrugation allowed thermal expansion of the panels. The bottom sheet was then covered with solder. Then the top sheet was soldered onto the bottom sheet by pressing with rollers while simultaneously applying heat from a burner. The last stage was folding the overlapping ends of the bottom sheets over the top sheet and soldering it, thereby creating a tight joint at the sides of the elements.

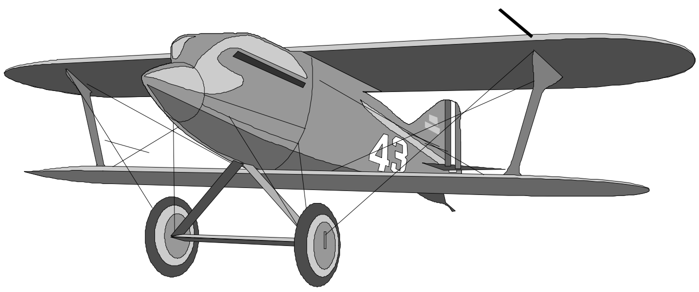


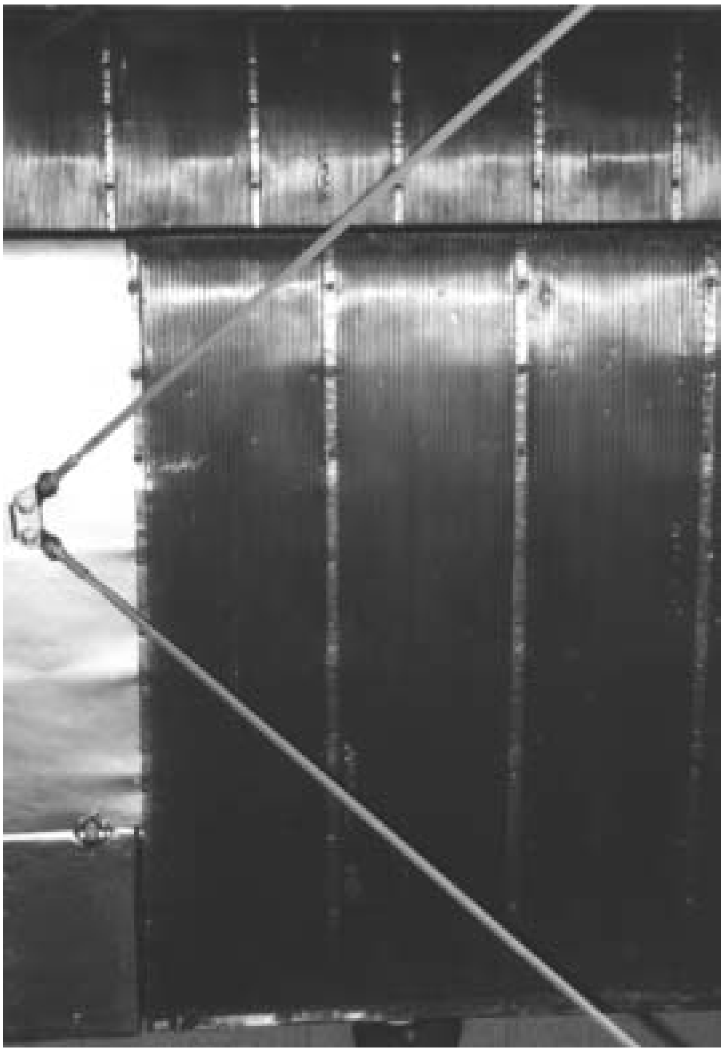
Figures 8, 9 and 11 of U.S. Patent No. 1565096

The entire radiator panels were completely assembled, including top and bottom surfaces and leading and trailing edges, before slipping them over the wings. The radiators did not carry any structural load, so they could be made of very thin and light material, only 0.004 inches (0.1 mm) thick.

The exposed surface area of the radiators of the R3C was 261 square feet (24.2 square meters). The system contained 12 gallons of water, which circulated at a rate of 15 gallons per minute.

The development of surface radiators headed down a dead-end street. They were only feasible due to the relatively low-powered engines of the time. The amount of heat that has to be removed from an engine is roughly proportional to the power of the engine. The amount of heat that can be dissipated by surface radiators is roughly proportional to the area of the radiators. Although the Supermarine S.6B and the Macchi M.C. 72 were almost completely covered in surface radiators the radiator area was not enough to cool the engines. The top speed was limited by the coolant temperature, not by the available horsepower. They could not be flown continuously at full throttle, but had to be flown with one eye on the water temperature gauge.





To the left:
Photo of the bottom wing of the R3C-2 that is preserved at the Smithsonian Institution, Washington, DC. Each radiator segment is around 9 inches wide and has around 36 corrugations, giving a quarter of an inch for each corrugation. In true scale this means there should be around 7.5 corrugations per millimetre in 1/48! There is also a narrow aluminium strip between each segment of the radiators, below the rivets that hold it to the wing surface.

References

- **U.S. Patent No. 1509251: "Wing Radiator Fastening", H.C. Mummert**, filed October 12th, 1923
- **U.S. Patent No. 1565096: "Method of Constructing Radiators for Use in Connection with Internal Combustion Motors", H.C. Mummert and W. Wait Jr.**, filed October 26th, 1922
- **U.S. Patent No. 1613619: "Aeroplane Radiator", H.C. Mummert and J.F. Meade**, filed November 29th, 1922
- **U.S. Patent No. 1623128: "Temperature Regulating System for Aeronautical Motors", H.C. Mummert,** filed December 8th, 1922
- **U.S. Patent No. 1650665: "Airplane Radiator", A.L. Thurston,** filed May 16th, 1921
- **U.S. Patent No. 1682204: "Aeroplane Radiator", W. Wait Jr.,** filed October 26th, 1922
- Drawings by **Joseph Nieto** from **Model Airplane News, May 1952,** available from Air Age Publications
- **Thomas G. Foxworth: "The Speed Seekers"** (Haynes, 1979)