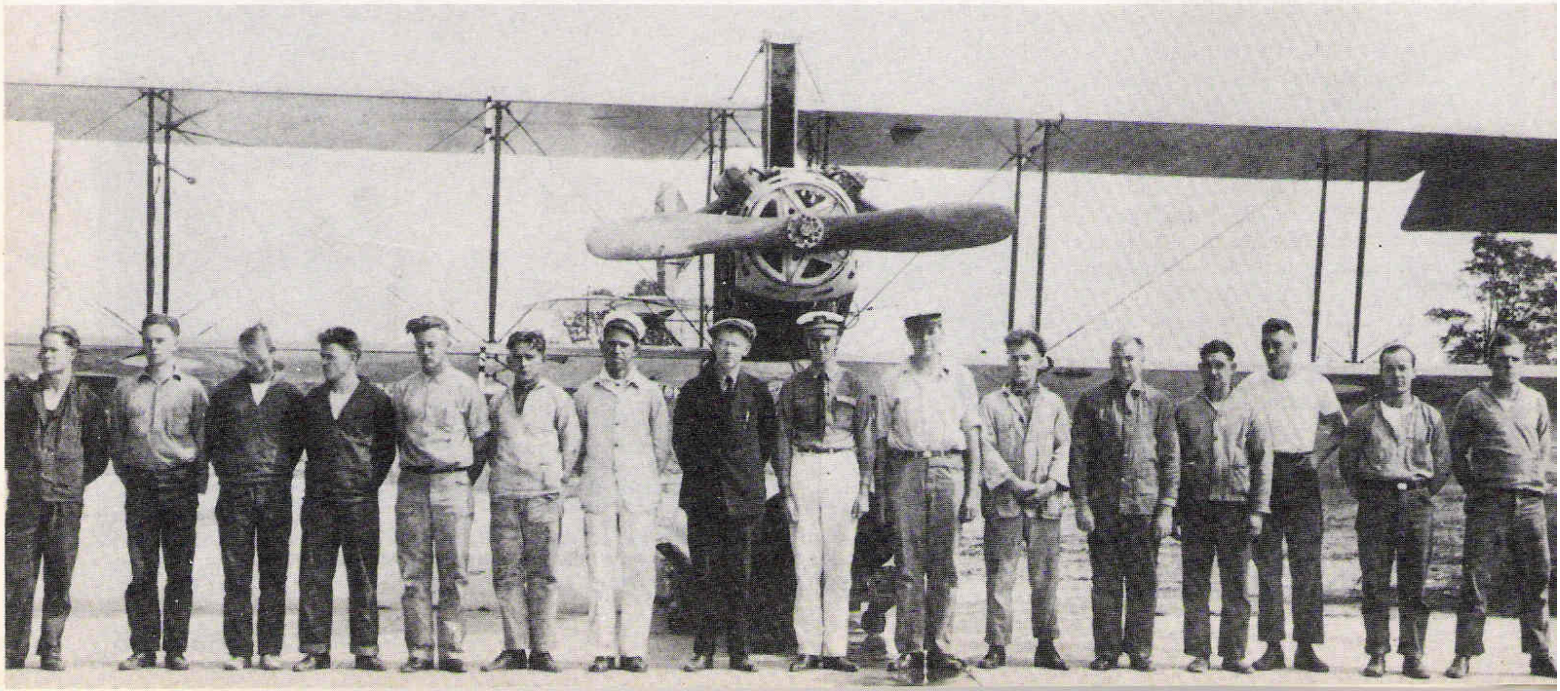
The Curtiss/Sperry Flying Bomb of 1917-18 was specified to weigh 500 lb. empty, carry a 1,000-lb. explosive load at a top speed of 90 mph, and have a range of 50 miles. It was launched on March 6, 1918 and followed its flight program for the preset 1,000 yards. As a result, it was claimed to be . . . "the first entirely successful flight of an automatic missile in this country, if not the world." Note that this was an internally preprogrammed flight and did not involve RC, but it was the first step in alternative control of flight. U.S. Navy photo #USN651991.

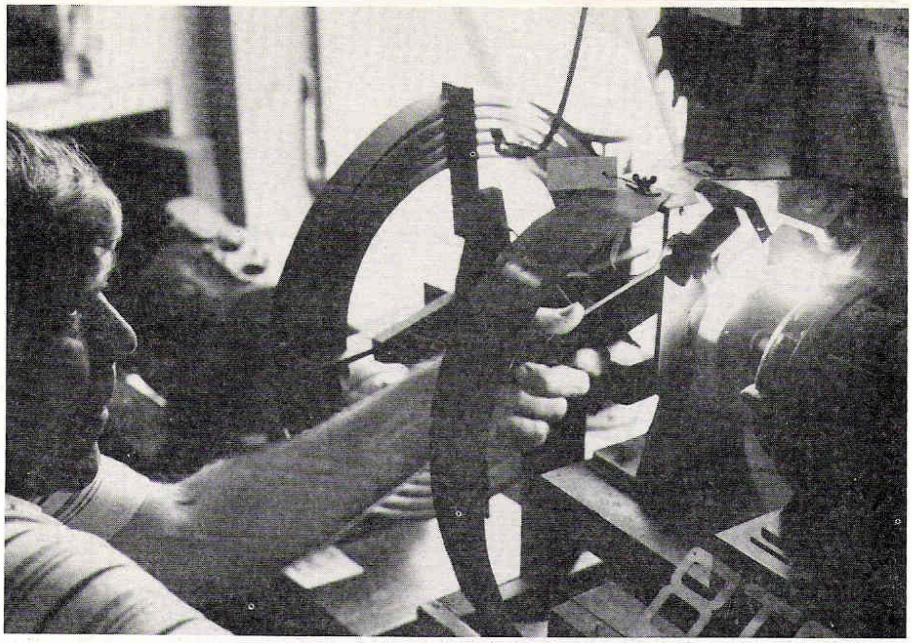
Walt Good

History of RC Flying

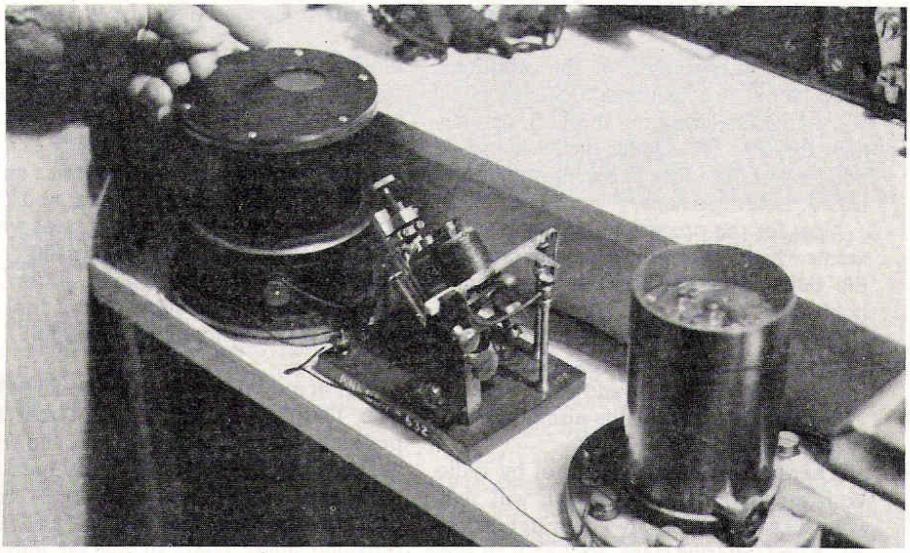
This Navy N-9 seaplane was successfully flown by RC on September 15, 1924 at Dahlgren, VA by Navy Lt. J.J. Ballentine, the officer directly below the propeller hub. On his right is Mr. C.B. Mirick, the designer of the radio control system. The second man on Ballentine's left is C.C. Middlebrook, father of RCer Carlton Middlebrook of the "Middlebrook Connection." Photo courtesy of the Naval Surface Weapons Center.



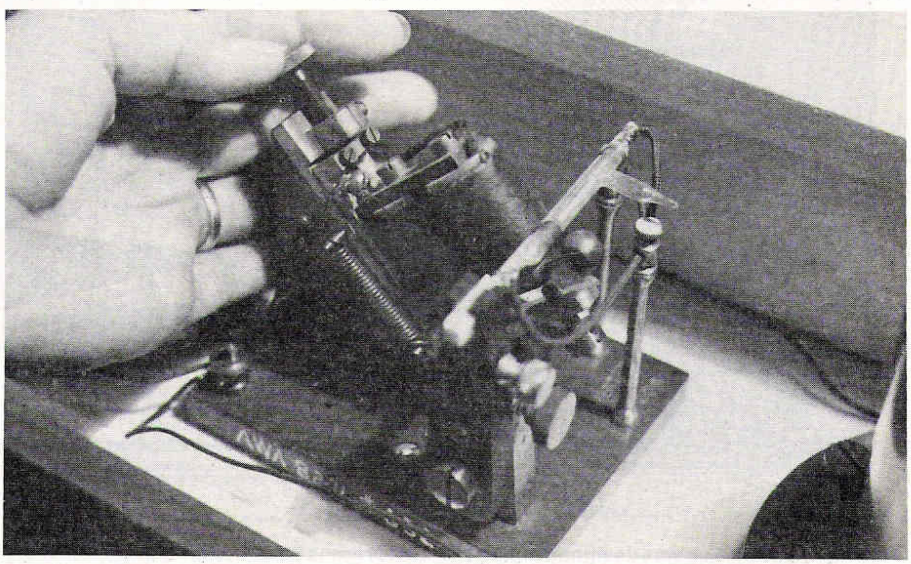
AMA's 50th anniversary is in 1986, and RC model flying also began about 50 years ago. We are privileged to present this three-part series authored by the man who, himself, was a key participant in the making of RC history. His start is with the precursors, the early building blocks for later developments. Part 1.



Bruce Kelley of the AWA (Antique Wireless Assn.) adjusts the gap of the synchronous spark transmitter. It uses 15,000 volts and has a transmitted output of 1,000 watts. It also produces a raucous noise so loud that Kelley must wear ear protectors. Photo courtesy of AWA.



A coherer radio receiver from the early 1900s. Antenna signal is connected to the thin white glass tube in the center of the photo just above the magnet coil. The glass tube is the "coherer" which contains powdered metal particles which change to a low resistance path when a radio signal is received. Resulting tiny current goes through the very sensitive relay on the left under the hand. The contacts of the sensitive relay energize the power relay on the right—which causes the center magnet to whack the coherer and reset its particles for the next signal. Only Morse code-type signals could be received by the coherer. AWA pic.



This view shows the coherer glass tube and the magnetic clapper which resets the metal particles in the tube after each signal is received. Antique Wireless Assn. photograph.

THE POPULARITY of Radio Control model aircraft as an exciting hobby is unquestioned today. All types of RC, from simple Gliders to the most detailed Scale models are popular and practical.

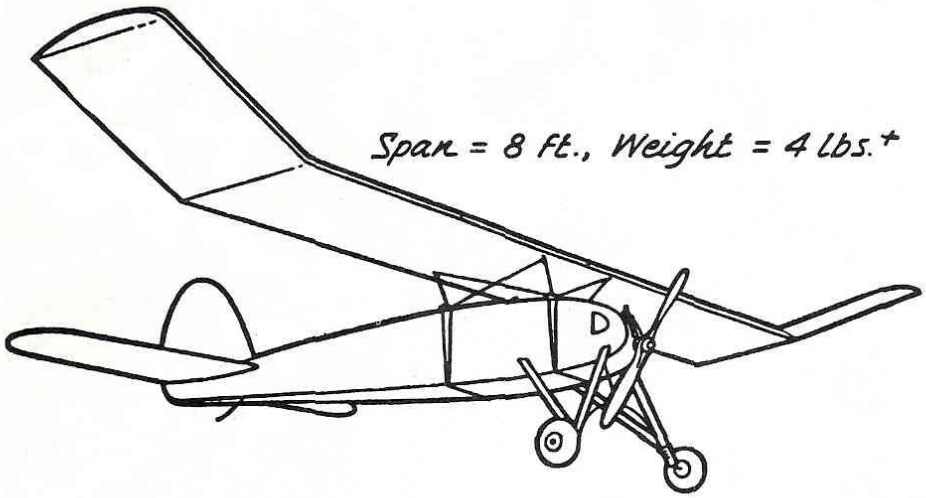
But there was a day—not too long ago in the memories of still-active RC old-timers—when the RC hobby did not exist. It hadn't yet been invented!

This is the story of how RC model planes got started in the U.S.A. Topics to be covered include who the pioneers were, what they invented, when and where it happened, and how and why they did it.

By coincidence, RC, as we hobbyists know it, began at almost the same time as the AMA. In fact, the first AMA *Model Aviation,* Volume 1, Number 1, June 1936, simply stated: "A new contest has been arranged, one for radio controlled models." No rules were mentioned, only that it would be held at the 1936 Nationals in Detroit.[1] Old-time RCers will point out that no RC entries actually showed up for that event, but that's getting ahead of my story, except to mention that the 50th anniversary of the AMA and RC will occur in 1986. This story is a part of that celebration.

This story will be primarily about RC model aircraft, as contrasted with RC model boats and cars. Even though a model boat was probably easier to rig with RC because of its weight-carrying ability, our interest—or obsession—is involved with RC planes.

Confining this story to happenings in the U.S. makes it compatible with the AMA's geographical area of interest as well as its involvement with the competition and radio frequency aspects of the RC developments. A broader review including other countries



AN EARLY GAS MODEL DESIGN
Maxwell Bassett - 1936

FIG. 1-3

The Basset 1936 gas model represented the status of stable Free Flight models of its time. This illustration reprinted from *Gas Models and Engines*, by W. Winter and W. Schroder.

would be interesting, but the additional effort would be considerable. Such a global story might determine if the U.S. actually flew the first RC model in the world—a point which has not yet been firmly established. Later, perhaps.

Now for the precursors, those developments which occurred earlier and provided the building blocks for the invention of hobby RC.

First, we'll recall the status of model airplanes in the early 1930s—just prior to the beginning of RC—and find what developments stimulated the aircraft portion of the invention.

Then a look at early control by radio, both military and commercial, will show what the state-of-the-art was prior to hobby RC's first faltering steps. Probably an even more helpful source of information comes from the amateur radio area which was blooming wildly in the early 1930s, as will be reported here.

In following issues more specifics on the first RC models, their builders, and their contests will bring out the slow steps which would eventually lead to "successful" controlled flights. In those days, if the RC model landed in the same field it took off from, it was considered "successful!"

Status of model airplanes in the early 30s. The Thirties began with the Great Depression, severe unemployment, and whispers of unrest in Europe. Candy bars and ice cream cones were a nickel. A dime could buy a balsa model plane kit which provided many hours of fun far into the night, while listening to Hoagy Carmichael's *Star Dust* and other hits of the Big Band era. TV didn't exist.

Money was scarce. I can remember my dad's salary, as a high school science teacher, was cut in half to help the town of Kalamazoo stay debt-free. Brother Bill and I worked part-time in the Kalamazoo College physics lab at the rate of 30¢ an hour! Part of that income bought a few model supplies. But to put it bluntly, times were tough.

What was the status of the model airplane world? It was vastly different from today. In 1930 models were either rubber-powered Free Flights or Gliders. With a little balsa wood, a tube of Ambroid cement, some Japanese tissue, and a few feet of rubber, you were ready for a contest. The contests, both local and national, were still being held in spite of the Depression. By 1934 the availability of the new tiny gas engine made possible the first gas-powered Free Flight (FF) event at the National Contest in Akron. The story of Bill Brown's gas engines and Maxwell Bassett's planes was well told by Dave Ritchie in *Model Aviation.*[2]

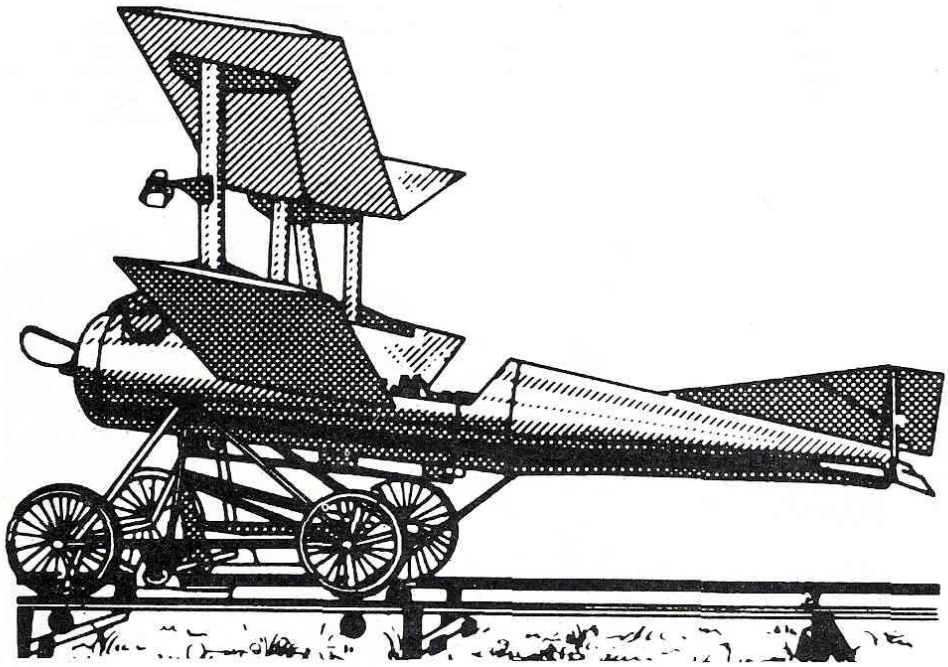
I have always chuckled about Bassett getting 4th place with his early gas model in the classic International Wakefield event held in 1932 at Atlantic City. Although this event was traditionally for rubber-powered models, the rules had never specified the form of power! After Bassett's success, the British quickly altered the rules to specify rubber power only, but the National Aeronautic Association, the U.S. rules-maker, did nothing to update the U.S. rules for their three U.S. outdoor "rubber" events.

You guessed it! Bassett took two gas models to the 1933 Nationals on Long Island, NY and proceeded to capture all the trophies from the rubber models. The exciting gas model had come into its own! The U.S. rules were then changed to provide the gas model with an event of its own. Bassett entered the new gas event at the 1934 Nats in Akron and won by a handsome margin. What a record!

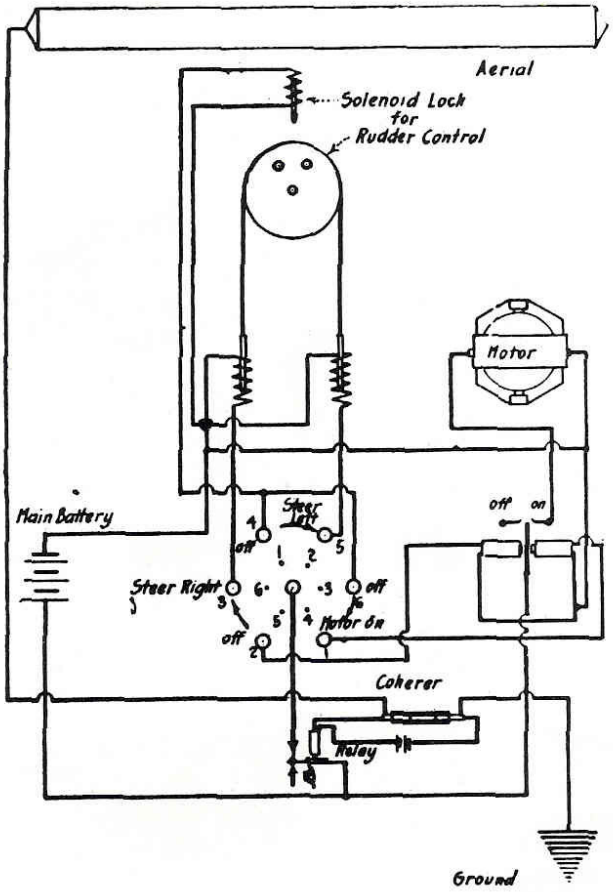
The arrival of the gas model was established. It would set the stage for the invention of the RC model.

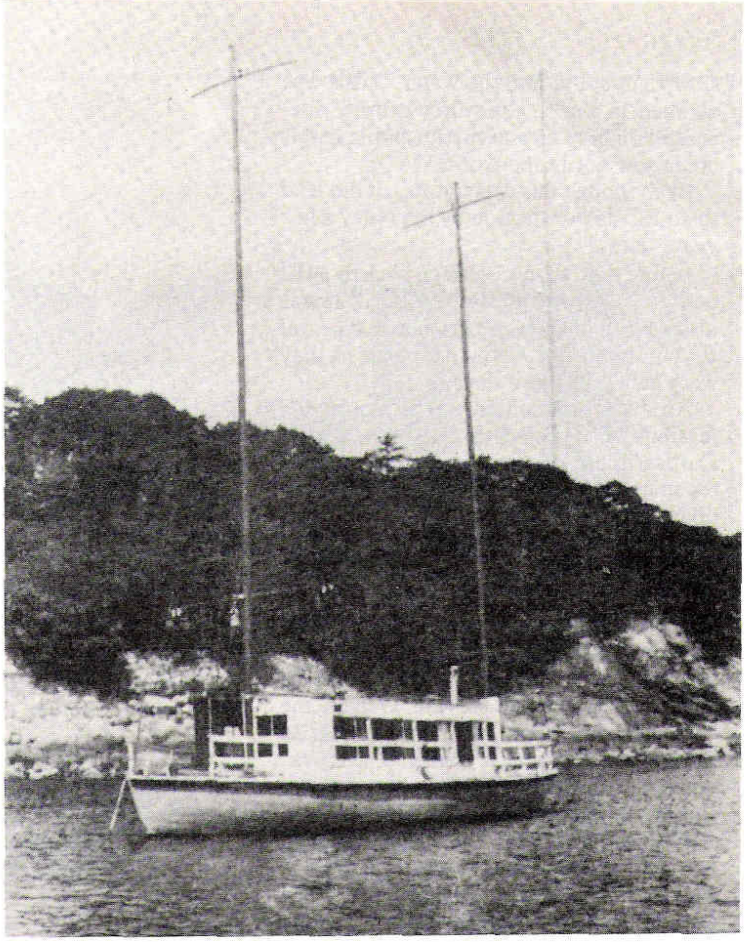
Another major element needed for RC flight was a small battery-powered radio receiver. Fortunately, such units were already being developed by the amateur radio community. These radios were being built and used by amateurs (also called hams) to talk across town on the 5-meter band (56 to 60 MHz). This new phase of ham radio was so much fun that "bootleggers" (persons without a license) also found great excitement from this hobby. Fortunately for them, the 5-meter band was barren of other allocations because, at that time, it was considered to be useless for commercial radio. At that time, the hams and bootleggers only interfered with each other.

The 5-meter band was destined to become the home of the early pioneers of RC. Many of the early bootleggers later became hams, and it is entirely possible that some



The Kettering Bug was designed to be a low-cost preprogrammed flying bomb and was flown experimentally in 1917-18. Power was from a 38-hp engine, and it had a 15-ft. wingspan. Dihedral of 10°, Orville Wright's idea, eliminated the need for ailerons. This project did not use RC. Drawing: USAF Course 3111, Fundamental Principles of Guided Missiles, 1956.





Left: This 1918 circuit diagram for a hobbyist-built RC submarine shows rudder solenoids and speed control with selector operated by a coherer receiver and relay. Right: An eight-ton RC houseboat demonstrated by B.B. Miessner in 1912. The boat was also a test bed for different types of detectors and proved the coherer to be the least reliable. Photo credit: B.F. Miessner, *On the Early History of Radio Guidance.*

of the early RCers were bootleggers. I was lucky; I had an identical twin brother who had a ham license, and we figured a radio inspector would have been hard pressed to tell us apart. I hope the statute of limitations has run out by now!

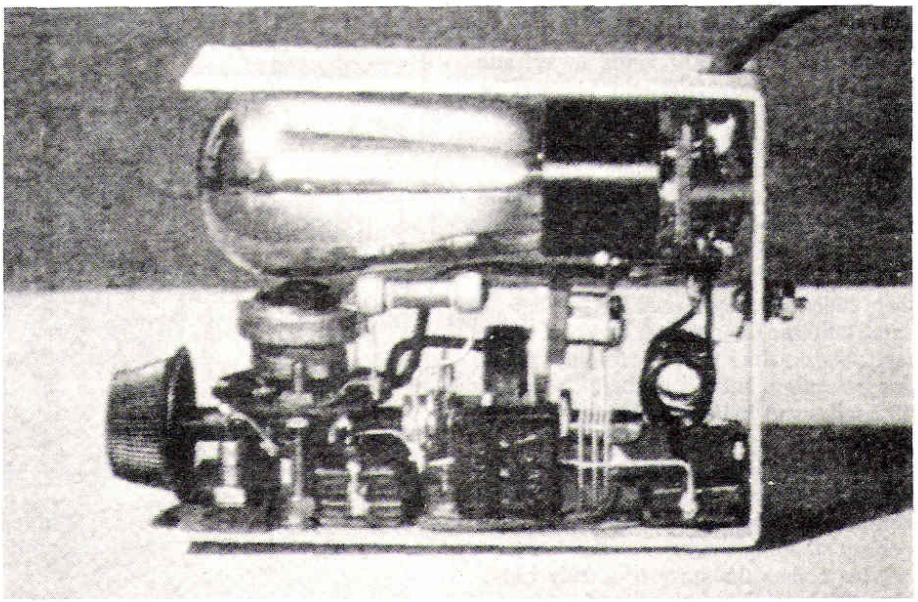
Military RC projects (around the early 1920s). Next, let's take a look at another piece of background information which may be relevant to the would-be model RCer, the military RC projects.

Although this account of RC development is directed mainly at the hobby aspects, there were several military developments in the 1916-1924 period which need telling because they show some of the problems that occurred even when top-notch technical engineers with sizable budgets were involved. Many of the hobby pioneers may not have been aware of these developments, but the intent here is to show the state-of-the-art in this earlier period.

First in the military development were the "flying bombs." These were pilotless airplanes with automatic preset controls that caused the plane to take off, climb to the preset altitude, level out and cruise in a preset direction for a preset distance, and then dive into the pre-selected target. Of course, these flying bombs were not radio controlled, since they were controlled by an internal mechanism.

In April 1916, Elmer Sperry (Sperry Gyroscope) and Peter Cooper Hewitt (scientist) started the development of a self-controlled plane using their own funds. By September they had a working system in a hydroplane which had gyro stabilization, directional control, and distance-monitoring gear. They demonstrated this system to the Navy with Lawrence Sperry as pilot and Lt. Wilkinson as the official observer/passenger. After the plane was airborne, the pilot released the stick and switched on the automatic controls. This directed the plane to climb to a predetermined altitude, steer itself on a set compass heading, and start a dive at a preset time—at which point the pilot restored manual control. Greatly impressed with the Sperry/Hewitt project, the Navy contracted $200,000 in May 1917 to support the design of a machine called the Curtiss/Sperry Flying Bomb.

Less than 10 months later, "On March 6, 1918, the Curtiss-Sperry Flying Bomb was launched successfully and performed all the functions planned for the test. The machine climbed steadily flying in a straight line. When the distance gear cut the throttle at 1,000 yd., as was set, the plane made a



An early "miniature" receiver with the cover removed. The Goods adapted this circuit to their RC model by replacing the headset with a sensitive relay—plus a lot of cut and try!

slow right spiral into the water." This was claimed to be "... the first entirely successful flight of an automatic missile in this country if not in the world."[3]

Even though this was not RC, it did lead to an RC demonstration by the Navy a few years later.

Before that, though, let's go back to 1917 and the story of Kettering's "Bug." It was also one of the pre-programmed types of Flying Bombs, or Aerial Torpedos as they were called in those days.

An Army committee was exploring the feasibility of a project similar to the Navy's Curtiss/Sperry Flying Bomb. The committee majority voted negatively on the feasibility, and the project would have died then and there if Charles Kettering (inventor of the electric starter for cars) had not produced a minority report which was positive. The day before Christmas in 1917, Kettering had the first meeting of his team. The three major sections of his plan were the airplane, assigned to Orville Wright, the engine to DePalma, and the controls to Sperry and Kettering. The emphasis was on high production and low cost for a one-shot expendable machine.

Within 10 months this team designed and built several "Bugs" which had 15-ft. wings, a 38-hp engine, Sperry gyros, and a pneumatic control system based on parts from a player piano. The biplane wings had 10° of dihedral angle for roll stability and to eliminate the ailerons. The extra dihedral was Orville's idea—he thought like a modeler. It could carry a 200-lb. payload for 50 miles at 42 mph. The expected production cost was $575 per vehicle.

The first test vehicle launched well but became erratic and crashed. The second vehicle, after some unplanned aerobatics, behaved like a large Free Flight model, leaving the airfield in large climbing circles to reach an altitude of 10,000 feet. It was later found 20 miles from the Dayton airfield.

Complete success was attained with the third vehicle on October 22, 1918. It climbed, leveled off on course, and dived toward the target 500 yards away, still within the confines of the field. This was the first successful demonstration of a small, low-cost Flying Bomb.

To avoid publicity and maintain secrecy, the remainder of the 25 Bugs were sent to Carlstrom Field at Arcadia, FL, where the large open uninhabited areas were more suitable for such testing. Since WW I had then ended, the additional tests didn't resume until the fall of 1919. Out of the nine launchings in the Florida tests, only the last one was completely successful, covering 19.5 miles and diving into the target area as planned.

Even though the "Bug" was internally programmed and did not involve radio controls, it certainly qualifies as an important stepping stone.

Now comes the story of a truly radio-controlled plane developed by the military. It started as an N9 Navy seaplane, gyro-equipped for automatic flight. In early 1922, the Navy Proving Ground, Dahlgren, VA, took on the task of adding radio control to this machine under the direction of C.B. Mirick.[4] His account deals with early vacuum tubes for the transmitter and receiver, the Morkrum eight-point selector switch, and the problems of making this gear work reliably in an aircraft environment. He relates further that their lab was so close to the Navy's large-gun test range, with its incessant earth-shaking booms, that most of the vibration problems were solved in the lab before the equipment was installed in the airplane.

Their control system started all of the controls from neutral and then gave left or right rudder, up or down elevator, and

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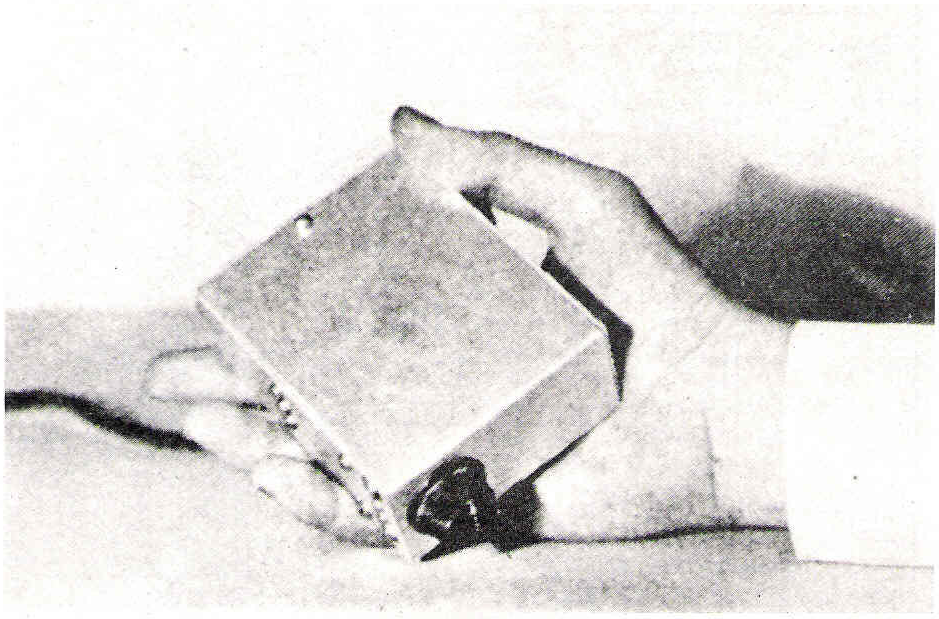
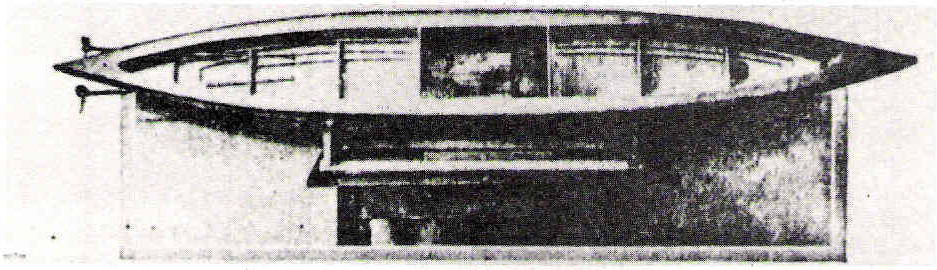
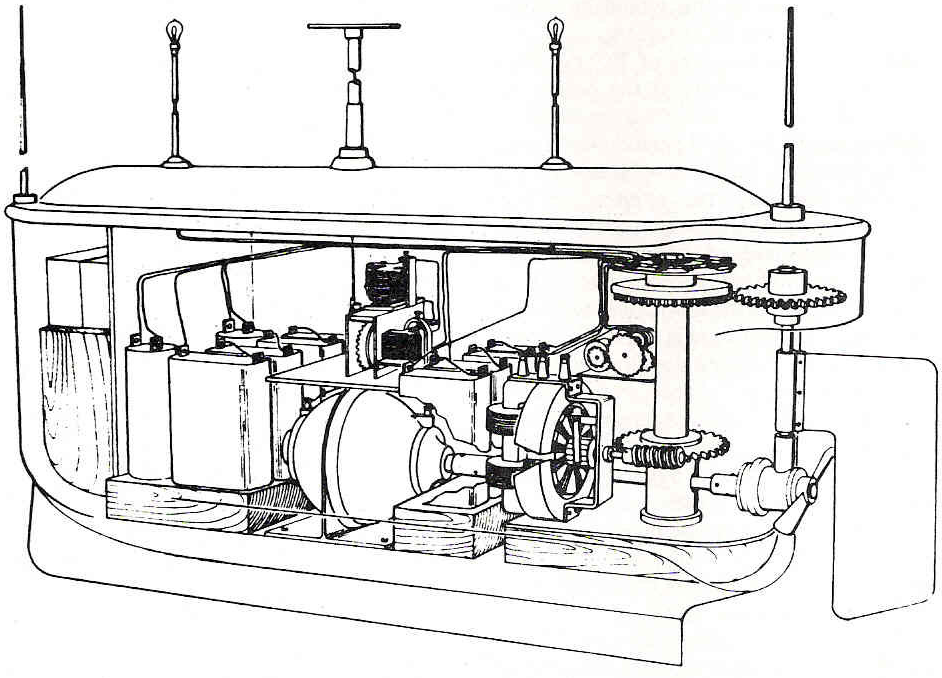


This featherweight receiver (shown on the previous page with cover removed), used by sailplane pilots at Elmira, paved the way for hobby RC to begin. Credit: *QST*, September 1933.



The 1918 hobby RC submarine, reprinted from *Model Making*, a book by R.F. Yates published by Henley, NYC, 1919. Can anyone provide the author with more information on it?



Tesla's 1898 RC model boat. It used a spark transmitter and coherer receiver. A selector system controlled rudder deflection and propulsion speed. Drawing from *MA*, March 1976.

Prepare the epoxy resin. Wearing protective gloves and using an accurate scale, carefully weigh out a predetermined quantity of EPON 815. Don't forget to record the weight of the empty container so that you can determine the net amount of resin. The amount of TETA catalyst should be in the range of 15-20% of the resin weight, 17% being about ideal. For example, if we assume an 8-in.-dia. prop will require 22 grams of EPON, then the amount of TETA needed will be an additional 3.75 grams, giving a total liquid weight of 25.75 grams. Mix the resin and catalyst thoroughly and allow it to settle for about 10 min. to permit the bubbles to clear.

Because of the way the mold was constructed, the bottom half is a natural reservoir and an ideal trough in which to lay-up the prop. Start by giving the trough area a heavy coat of epoxy resin, and lay in the longest rovings, arranging them to straddle the center post. Always keep the strands centered lengthwise in the mold to assist in equalizing blade balance. Use a small stick (1/16 x 1/4 in.) with a smoothed and rounded end to spread out the filaments to cover as much blade area as possible. Add more resin and progress to the shorter lengths, using the stick to maneuver the strands and work out any bubbles that might be trapped. The hub area can be filled with 1-in. and shorter clippings, keeping the whole mass wet with resin. Keep the filaments confined to the blade area, and do not let them slide into the closing faces. You will notice that the rovings begin to take on a silver, translucent appearance with some of them seeming to disappear entirely. This is a sign that good wetting and the necessary resin penetration is occurring.

With all of the glass in place and the trough filled with resin, coat the top mold face with resin and slide it down onto the center post. Check to make sure that the mold match marks correspond, because if the mold is closed with reversed ends, you will never be able to reopen the mold or salvage what you have done to this point. Manually bring the top mold down to within about 1/8 in. of closing, then position four clamps as shown in one of the pictures. The clamps should be very slowly and evenly tightened until the faces close tightly. There will be some loss of glass and a lot of oozing of resin from between the faces, but this is normal. Too much glass loss indicates that you either overstuffed the mold or closed it too rapidly. Cleaning up can be accomplished with acetone or epoxy thinner.

Lay the mold aside, making sure it is level, with something underneath to catch the cascading drips. At normal room temperature, the prop will take five to six hours to harden—considerably less if left in direct sun or in a warm oven. Check the stiffness of the end spears if there is doubt.

When convinced that the epoxy is firm, loosen the clamps and use vice-grip pliers to remove the center post with a twisting pull. It is advisable to trim away any washed-out rovings that have formed on the long sides, since these will interfere with opening the mold. Leave the end spears untouched at this time.

A five-minute soaking of the mold in very hot water can sometimes do wonders in getting it to come apart. Insert a sharp knife or screwdriver at several places along the parting line, and the two halves should separate. To free the prop, again immerse in hot water. Then lift the flashing flaps to loosen their grip, especially in the hub area, and pull up on the end spears. The prop should snap free of the mold.

At this point, you should be holding a molded prop attached to a rectangle of thin flashing. Most of this flashing can be cut away with scissors—up to within 1/8 in. from the mold line. A sharp, flat, medium-coarse file is used to remove the last 1/8 in. by filing along the cleft line between the flash and prop. Just a few strokes will do the job nicely. The area around the hub can best be removed with an X-Acto knife and file. The end spears are cut away with scissors after first filing a groove across the tongue with the sharp edge of a file.

Balancing the prop is accomplished with a file and/or sandpaper, progressing from No. 150 to No. 300 for the final polish. Restrict your balancing work to the top (curved) surface; otherwise, you stand a good chance of altering the blade pitch.

If you need help locating supplies or cannot purchase them in small lots, please contact Bob Dunham, 4730 So. Yorktown, Tulsa, OK 74105. A starter kit consisting of auto body filler, PVA, EPON 815, TETA, vinyl gloves, and fiberglass rovings can be furnished for $60, postpaid anywhere in the U.S. This kit contains enough filler, fiberglass, and other liquids to make a couple of molds and 20 to 25 medium-size props.

Material Sources

Auto body filler: CUZ from NAPA Automotive Stores; White Knight from K-Mart, Wal-Mart, and most auto supply parts stores.

Steel-filled epoxy: 1 qt. kit EPOCAST #11B-A with #9812 hardener from E.V. Roberts & Assoc., Box 868, Culver City, CA 90232; phone 1-800-421-0824.

Epoxy resin: Shell Chemical EPON 815 from E.V. Roberts & Assoc.

Epoxy catalyst: TETA from E.V. Roberts & Assoc.

Polyester resin: K&B Manufacturing, from most hobby shops.

Fiberglass rovings: Owens-Corning Product #447-211 or #352-211; CertainTeed Product #282-B1. See Yellow Pages under Fiberglass Materials.

Carbon fiber tows: Gougeon Bros., Box X908, Bay City, MI 48707; NFFS Supplies, 12 Cook St., Rowayton, CT 06853.

RC History/Good

Continued from page 60

throttle on or off—one at a time. Panel lights indicated to the airborne pilot which control signal was being transmitted by the

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RC History/Good

Continued from page 123

ground-based pilot.

Most of the flight tests used an airborne pilot to monitor the response of the blinking light signals without actually switching the RC signals to the airplane controls. The maximum signal range was two to three miles with the ground-based 50-watt transmitter. On one of the few flights in which the RC signals were in control and the airborne pilot was the observer, ". . . the radio control of the rudder took hold with such vigor that the control cables of the plane were torn loose, and the plane fluttered down in the midst of a fleet of oyster boats, the pilot steering with the ailerons!" After that experience, the eight-point selector was replaced with tuned reeds which allowed simultaneous control of the several controls and much better flying. Yes, tuned reeds were well known at that time.

Finally, on September 15, 1924, the first pilotless RC flight of the N9 seaplane, then dubbed the "Wild Goose," took place at Dahlgren, VA. The unmanned plane took off and circled for some 12 minutes at altitudes up to 500 feet. The range from the transmitter was two to three miles. It was found that the plane responded to most of the inputs by Chief Radioman E.L. Luke—as he followed the verbal instructions from the Aviation Officer, Lt. J.J. Ballentine. ". . . at one point when there had been failure of response to two or three signals for right turn, C.B. Mirick shouted a suggestion that they try left turn, which greatly delighted Commander Pickens." . . . "A little later the plane got back over the land, lost altitude, and seemed bent on dive bombing a farm house, but a timely up flipper signal brought it up, and it came out over the water to what seemed to be a smooth and successful landing."

The "Wild Goose" had flown by radio control!

Not immediately known to the observers, the landing had cracked the pontoon which began to leak and caused the plane to nose over and sink. The plane and gear were recovered from the river, but severe corrosion had rendered the parts unusable. The project was terminated at this point.

This was a significant first in RC. A plane had made a complete, witnessed, controlled flight with RC. It was a professional project funded by a military organization—a lot of effort for one flight, but a step along the way. Yet it still wasn't hobby RC.

There's a personal addendum to this tale which I call the "Middlebrook Connection."[5] While digging out this story, the name of Charles Middlebrook was mentioned as the civilian engineer who had adjusted the gyros just before the plane taxied away on its historic flight. This name "rang a bell," since we had flown RC models with a Carlton Middlebrook at the Dahlgren base in the 1960s. It turned out that Carlton was Charles' son, so more information about the "Wild Goose" came flowing out.

The stabilizing gyros had been built by Carl Norden of Norden Bombsight fame. Carlton's brother, also named Charles, had inherited the wooden propeller from the "Wild Goose" and said the N9 was also called the "Navy Jenny" and had been built in the Naval Aircraft Factory in Philadelphia.

Further, Carlton recalled the visit of a retired Navy admiral to one of the annual RC record trials at Dahlgren. The admiral, with Maynard Hill's coaching, flew one of the record models for several minutes of RC flight. Who was the admiral? He was the former "Lt." J.J. Ballentine who had called the signals for the Navy's first RC flight of the "Wild Goose" in 1924! What an appropriate connection with the RC history of the past.

RC links with the origins of commercial radio (early 1900s). Now we'll step back even earlier in history. There is an early stage of the RC story which I classify as "Commercial Radio," which involved brilliant experimenters plowing the new territory of radio waves and their applications. Many experiments resulted in patents, large royalties, and fame—along with patent suits and many tribulations.

Probably the earliest RC experimenter was Nicola Tesla (1856-1943).[6] He devised RC gear and gave demonstrations in

1898 of several radio-controlled model boats—at Madison Square Garden in New York City, no less. The story says the actual rental of the building ($10,000 a week!) was paid by his friend, John Hays Hammond, Sr. Tesla's intent was to attract public attention to his overall work, not just RC. He was awarded a U.S. Patent on November 8, 1898 for "Method of and Apparatus for Controlling Mechanisms of Moving Vessels or Vehicles." His patent mentions RC examples of boats, carriages, and balloons as the possible vehicles. No mention was made of aircraft, however; perhaps this was because the Wright brothers hadn't flown then.

Tesla's primary success came from the alternating current (AC) generators he pioneered. He sold these patents to Westinghouse for one million dollars!

His inventions ranged far and wide in the electrical and radio fields, including some of the first concepts of intelligent robots and other automatons. Tesla sued Marconi for patent infringements when Marconi introduced wireless telegraphy in 1901. Other early inventors sued Marconi, too. Marconi had combined the good parts of the contributions of others, creating a "working radio system" for transmitting and receiving, while the others had provided only the parts. The U.S. Supreme Court ruled in favor of Marconi in 1915. Some said the court did not understand the complex technical aspects. Marconi made millions. Tesla, the controversial genius, died penniless in 1943, mostly because of his elaborate experiments.

Another contributor to early "Commercial Radio" was an American named B.F. Miessner. At age 22, as a top-notch inventor/experimenter, he demonstrated RC of an eight-ton houseboat to the U.S. Army in the fall of 1912 near Goucester, MA.[7]

Distance tests were made using a 1,000-watt spark transmitter on the shore and several types of detectors on the houseboat. Miessner found that the "catwhisker" crystal detector would operate the sensitive relay to a range of a half-mile and the vacuum tube detector to a range of three miles.

The "coherer" detector had been dropped earlier because of its very short range and vibration problems. It used iron-nickel particles in a small glass tube with an electrode at each end. Each radio signal would "lock-up" the particles, causing a low resistance path and allow the sensitive relay to be energized. After each lock-up, the coherer had to be unlocked by tapping the tube or flipping it over.

John Hayes Hammond, Jr., for whom Miessner worked at that time, said: "The two essential things we must get are a reliable, sensitive relay and a stable form of detector." These are the same requirements that the pioneering RC modelers would encounter more than 20 years later. Miessner adopted the vacuum tube for the detector. He converted a Weston meter into a relay by adding delicate contact points.

Miessner's experiments were so successful that he wrote his first RC book called *Radio Dynamics* in 1916, before he graduated from Purdue University.

Later, he was involved in several patent infringement suits with his former employer, J.H. Hammond, Jr. However, he went on to "invent" the superheterodyne receiver and the FM frequency modulation system. Both of these were contested by other inventors, including Major Armstrong. It is difficult to determine who was really "first" in many of these radio inventions.

Miesner did not suffer financially from these squabbles. His patents and royalties netted him over two million dollars.

Our radio broadcasting industry bloomed from the work of these pioneers. The big-name electrical companies (General Electric, Westinghouse, RCA, and others) were born in this period.

It should now be clear why I've called this money portion of the RC story "Commercial Radio." However, these experimenters did invent the basic circuits of radio communication which the hobby RC pioneers would eventually employ.

Contributions from amateur radio. In spite of the important contributions from the commercial and military areas, the RC model airplane was to be invented by amateur modelers and amateur radio hobbyists. It is appropriate that we take a look

at the status of amateur radio prior to the 1930s.

The only radio frequencies available to the RC pioneers in the 1930s were those designated for amateur radio use. The user was required to have an Amateur Radio License, which was obtained by an examination in Morse code and radio theory.

I can remember when my brother, Bill, took his exam in 1932 while he was still in high school. The government examiner came to the Kalamazoo Post Office and gave the exam. He must have been a kind person, because when Bill missed too many words on the first code test, the examiner said, "You're just nervous; give it another try!" Bill did, and he passed. Then the long written exam took him almost six hours—but he came through as W8IFD!

By 1936 there were 20,000 active hams (amateurs) in their national organization, the American Radio Relay League (ARRL).

While looking for background materials on the status of amateur radio technology in the mid-1930s, I found a book written by Clinton B. DeSoto, assistant secretary of the ARRL.[8] Published in 1936, it was just what I needed to refresh my memory and lay the background for this story. The book, *200 Meters and Down,* starts with the first amateur station in 1899. There were no required licenses, and the only real use of the new world of radio was the communication between Navy ships—up to a maximum range of 10 miles. The practical use of radio was just beginning.

By 1910 there were more amateur stations than all of the Army and Navy stations put together. Immediately there arose the ugly problem of radio interference between the several groups of users. When you take a look at their equipment, the source of the interference becomes very obvious. The transmitters using spark gaps (tubes weren't available) produced thousands of watts of energy and radiated signals with approximately 200-meter wave lengths (1.5 MHz). However, the spark signals were so impure that they smeared out from 1.2 to 2.0 MHz. Even the best "cat whisker" crystal detector receiver would pick up many different signals simultaneously. Wow, what a mess—not suitable for hobby RC at all. This early frequency band eventually became our present AM broadcast band.

When the first frequency assignments were made in 1912, the Navy pushed for eliminating all amateur stations by providing them with no frequency assignments. This negative action brought vehement reaction from the amateur ranks and caused amateurs and the amateur clubs, led by Charles Stewart from Pennsylvania (later vice-president of ARRL), to promote a compromise: all amateur transmissions would move to frequencies above 1.5 MHz. The Navy was pleased, in a sly way, because they preferred frequencies below 1 MHz and, further, believed that the region above 1.5 MHz was useless for long ranges. The Navy felt they had given away something useless and had gotten rid of the amateurs at the same time. How wrong they were took almost a decade to be realized.

Since 1.5 MHz is a wavelength of 200 meters, DeSoto entitled his book *200 Meters and Down.* Because I think better in terms of frequency, I would have preferred *1.5 MHz and Up.* Either way, for a while the amateurs "owned" all of the frequencies above 1.5 MHz.

March 1913 saw a terrible Midwest storm disable parts of Ohio and Michigan, leaving them without communication to the neighboring areas. The amateurs in the devastated area immediately started relaying messages to the outside world, and the rescue efforts quickly began. This was the first time that newspapers gave heavy front-page coverage to the heroic actions of the amateurs for their public service efforts. The favorable publicity resulted in a new recognition at many government levels that the amateurs were vital to our country's emergency service and should be supported.

In 1917 the U.S. entered World War I, and you can guess who immediately filled the ranks of the military radio units. Yes, it was the already-trained amateurs.

In 1929 the government adopted new regulations (in conformity with decisions of the 1927 World Radio Conference), taking back some of the spectrum which it had assigned to the amateurs earlier, but leaving a seemingly generous allotment in a number of small bands. One of these was a four-MHz slice starting at 56 MHz, called the 5-meter band. Just a few percent of the amateurs, maybe a thousand nationwide, had started to explore this band, so the techniques were developing, and the band was virtually empty. The 5-meter band was destined to become the home for RC pioneers.

We RC modelers should be grateful for the frequency legacy that amateurs and the ARRL obtained and shared with RC-ham developers who pioneered the RC hobby. For example, a tiny one-tube receiver used by glider pilots at Elmira to gather information from the ground was later converted for RC use.

This band was the main one used for RC models from the mid-1930s to the early 1950s when the AMA secured the first frequencies for RC applications. What's more, a small group of ham-RCers still use this same band today—some 50 years later. It is now called the 6-meter band, since it was moved to 50-54 MHz after WW II.

DeSoto made some very astute predictions in 1936 regarding the future of amateur communications, especially in his technical expectations—but he failed to mention the possibility of RC models. However in 1938, just two short years later, he entered a plane in the RC event at the AMA Nats in Detroit and became a prolific writer on RC topics. Even *he* must have been surprised at that.

The first RC hobby model? One strange RC project came to my attention through

John Brown of Santa Ana, CA. John sent me copies of 40 pages from a book called *Modelmaking.*[9] This book was edited by Raymond F. Yates, a well-known writer of the time. The article, "A Model Submarine with Radio Control," did not list an author; perhaps it was Yates, himself. I just can't resist including the submarine story, even though its heavy-weight RC gear wasn't suitable for a plane.

The subject was an 8-ft.-long, 175-lb. submarine with radio controls for steering and electric motors for propulsion. The transmitter was a 2-in. spark gap on a broad band of frequencies, and the receiver was a coherer detector. Maximum range: 300 feet. The highly-detailed drawings and photos are convincing, but there is no description of a public demonstration. However, there is an annotation: "This book is published at a time when wireless work of an experimental nature is prohibited by the United States Government." That wasn't too surprising, as the U.S. was involved in a war at that time. The date? It was 1918 during World War I!

I surmise that the RC submarine project had been started before WW I and was almost finished when the wireless prohibition prevented the actual RC demonstrations. It is not known whether later tests were performed. It is believed that this article was published originally in *Everyday Engineering Magazine* in 1917 or 1918. Can anyone help solve this mystery?

This submarine model may have been the first hobby RC project in the U.S. We really don't know. We do know that this was not a model plane, which is really what our story is about.

Summary. We now know the precursors which set the stage for the invention of hobby RC model planes.

- The gas engines and the gas models by the Browns and Bassetts of the early 1930s.
- The amateur radio hams with their knowledge and interest at a hobby level for direct application of their radio techniques.
- The military, whose RC projects of the 1920s had demonstrated technical feasibility but by no means offered a direct transition into hobby RC.
- The commercial radio industry provided some of the circuits and components, but no direct help on their application toward hobby RC.

It was up to the modelers and hams to blend together the results of these precursors into a working RC model plane. In the next installment we'll see how they met this challenge when we recount their early stumbling steps in the first-ever RC competition at the 1937 National Contest in Detroit.

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Safety/Preston

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Park Authority (city, county, etc.) to pass an ordinance which would require a use permit which, in turn, would require insurance coverage. According to Russell Knetzger, the cheapest way to obtain liability insurance is to join AMA.

Most letters I received on this subject addressed the question of how to determine if a flier is an AMA member. All