[redacted]
Brooksville, ME 04617

March 26, 1986

Dear Bill,

Attached is a piece which might be of interest to some of the old-time Navy people in our organization. It is longer than I would like it to be but I couldn't seem to pare it down without getting into the meat. I have taped suggested captions onto the pictures but please feel free to put on anything you think would be better.

I trust that you have had a fine winter and that things are going well with you. I am still going strong at this end.

73

Al

Al Gray 810-P

RADIO OPERATING THE HARD WAY

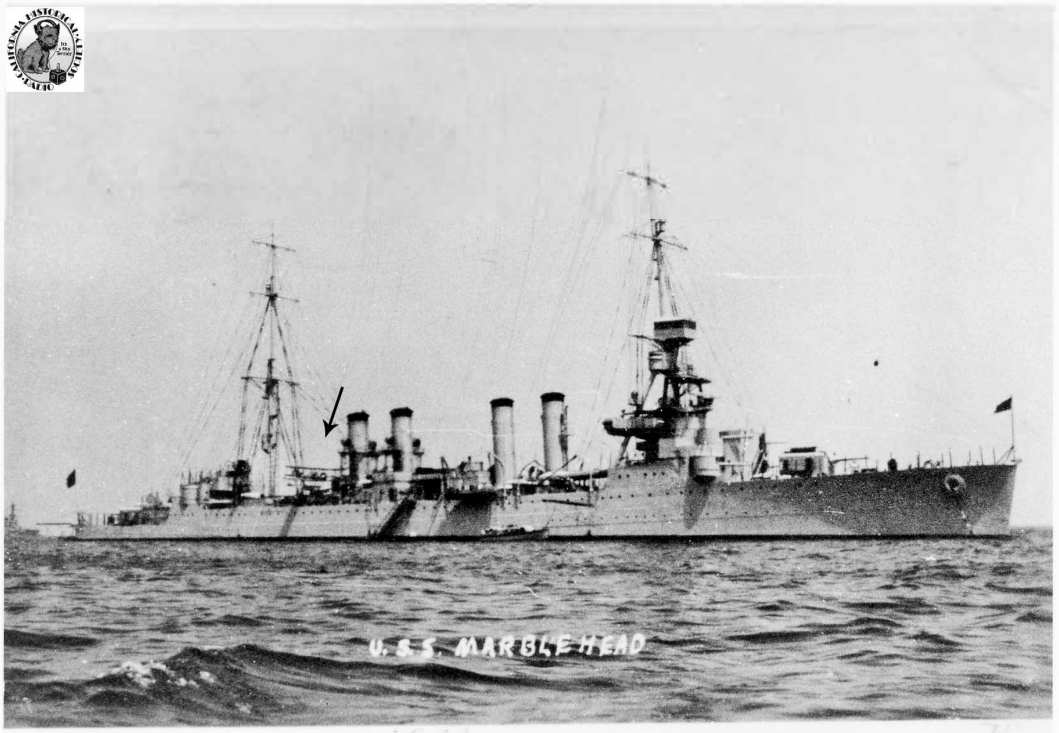
By Capt. Almon A. Gray, USNR (Ret.) SOWP-810-P

The SPARKS JOURNAL has carried a number of excellent articles about aviation radio, both military and civil. Most of them have related to large aircraft with multiman crews in which the Radio Operator was a specialist who devoted almost full time to the maintenance of communications. This article is a bit different in that it relates to small, two-man aircraft in which the radioman performed many diverse functions in addition to operating the radio - the scouting planes of the U.S.Navy.

From about the mid-twenties until radar became generally available during WW-II, each cruiser and battleship of the Navy carried at least two aircraft aboard. Their primary function was to scout ahead and around the ship or formation to detect and give warning of enemy ships or aircraft. In effect they extended the "range of vision" of the surface units as did radar later on, but in a slower, less precise manner. They also performed secondary functions such as directing the fire of the main batteries, dive bombing, strafing, and air-to-air combat. While the aircraft units normally operated with the ships on which they were based, they also were organized into Aircraft Squadrons, and could function as such. For example the aircraft units carried aboard the ships of Cruiser Division Two, in the aggregate, comprised Scouting Squadron Five.

From May 1933 to March 1935 I served in this type of aviation, having been assigned at different times to the Aviation Units of the light cruisers USS TRENTON, USS MEMPHIS and USS MARBLEHEAD. Therefore what follows relates specifically to light cruiser aviation. The heavy cruisers and battleships used aircraft very similar to ours, but produced by a different manufacturer. Their radio gear was identical to ours and their method of launching and recovering aircraft was the same.

SHIPS. The MARBLEHEAD class of light cruiser was a 7,500 ton, four screw, four stack, oil burning, steel vessel built in the early 1920s. It had 6-inch guns in the turrets, torpedo tubes, and depth charge racks. There was no armor, as the ships were designed for high speed and maneuverability. Outboard on each side of the weather deck, between midships and the after quarter, were two catapults for launching aircraft. Each catapult was a long steel structure supporting two parallel tracks or rails along which the "car" could slide. The rails were approximately three feet apart. The structure could be trained in azimuth just as a gun turret can be trained. The "car" was a device which could slide freely along the track, but which was prevented by flanges from moving laterally or upward. The top of the car was designed to fit the bottom of the plane's main float in such a manner that when the plane was clamped to the car it would remain there until the car struck the snubber at the end of the track, at which point the car stopped and the plane kept on going straight ahead. The car was propelled by being



U.S.S. MARBLEHEAD (NIRR) Photo circa 1932
Note aircraft on catapult abaft number four stack.

BERLINER-JOYCE Observation/Scouting plane
Model OJ-2 Manufactured 1932

connected by heavy steel cables and a system of pulleys to a piston/cylinder arrangement actuated by compressed air. Very high air pressures were used because the track was only about eighty feet long, and the plane had to be up to flying speed (an airspeed of about 100 MPH) by the time it reached the end of the track.

AIRCRAFT. The aircraft used aboard the light cruisers were manufactured by Berlinger-Joyce and bore the Navy designation OJ-2. They were single engine, open cockpit biplanes with two seats in tandem. The wings did not fold. Constuction was metal tubing framework with fabric covering. The engine was a radial but I have forgotten its rating --- probably around 350-400 HP. When operating off the ship the aircraft was rigged as a seaplane, with a large main float in the middle, under the fuselage, and a small float under each tip of the lower wing. When operating from shore bases for extended periods the floats were removed and replaced with wheels, and the aircraft became conventional landplanes. There were two thirty-caliber machine guns. One was fix-mounted on top of the upper wing and was fired by the pilot, who aimed it by aiming the whole airplane; the other was a "free" gun operated by the man in the rear seat, usually the radioman. It could be trained in azimuth about 90 degrees each side of the tail and could be aimed from about 30 degrees below horizontal to about 45 degrees above. (At first there were no "preventers" and the gunner had to be very careful not to shoot off his own tail surfaces.) The gas tank had capacity for about three and a half hours of flying time but because weight was critical in catapult launches, planes were seldom gassed for a hop of longer than a couple of hours while operating from shipboard. The engine was started through use of a hand-cranked inertial starter.

RADIO GEAR. Light Cruiser aircraft used a Navy type MB-2 radio set. This was vacuum tube gear comprised of a regenerative receiver and an MOPA transmitter built into a common case. These were separate and independent units and did not utilize common circuitry as is done in modern transceivers. The frequency range was quite limited, being from 500 to around 950 KHz as I recall. One had a choice of CW or MCW emission. The tube which modulated the CW also served as a "howler" to permit the operator to hear his own sending. The transmitter used triode tubes, similar to type 210, and the power output was 15-20 watts. A generator mounted on and driven by the main engine provided 6 VDC for the plane's electrical system and for the radio tube filaments. A second winding on the generator provided about 700 VDC for the transmitter tube plates, which was dropped to appropriate voltages for the receiver. The telegraph key was mounted fore-and-aft on a narrow shelf along the side of the cockpit where it was reasonably handy for a right-handed person. The key itself was an outsized device intended to be used by a person wearing heavy gloves. The knob was a disc about two inches in diameter, atop of which was a ball about an inch and a half

in diameter. The gap was usually kept at around an eighth of an inch and spring tension required considerable pressure to close the key. Obviously no speed records were set while using these keys!

The headphones were built into the leather helmets worn by the aviators of that time. The phone cord terminated at the far end in a conventional phone plug. The radioman's cord was extra long so he could move around the cockpit and operate the machine gun while still guarding the circuit.

The antenna consisted of two or three hundred feet of about #14 stranded, bare wire wound on a hand cranked reel at the right side of the cockpit, beneath the key shelf. The end of the wire passed down an insulated tube through the bottom of the cockpit and was fastened to a heavy, streamlined lead weight, known as a "fish", whose purpose was to keep the wire from whipping, and well clear of the fuselage, when the antenna was reeled out. Tuning the antenna was simple; one merely held the key closed and reeled out wire until the meter showed the highest reading.

Wires also were strung inside and between the upper and lower wings on the starboard side to constitute a loop type receiving antenna which was used for radio direction finding purposes. The whole plane was turned in order to find and follow a "null".

The final piece of radio gear was a Frequency Meter which operated on dry cell batteries. It was mounted in a box about ten inches square which was strapped to the deck under the radioman's seat. When wearing cold weather gear, together with life jacket and parachute, it was virtually impossible to reach this instrument, let alone use it! With the airstream sucking things out of the cockpit, and the plane bumping all over the sky, one was lucky to be able to change frequencies, using the frequency meter, in less than five minutes. It frequently took longer.

There was no intercommunication circuitry between the cockpits so that, once in the air, any communication between the pilot and the rear seat man had to be carried on via signs or by scribbled notes passed back and forth. To facilitate this, and to make it easier to copy radio traffic, I used to have a small clipboard with a pad of paper and a pencil fastened to it that clamped over my leg, just above the knee.

OPERATING. Actually the radio operating part of the job was simple; it was the collateral work that made things interesting! We would send in position reports every thirty minutes or so, and the ship might send us a message to "return to ship" or "return to North Island" or something similar, but there were no long messages. The ship always made it a point to have one of its best operators on the aviation circuit, and as the circuit speed was seldom over 10 WPM we

usually did not have too much difficulty. Our greatest problem was in getting signals strong enough to copy. Because of our low power and the characteristics of the frequency used, signals from the plane dropped quite rapidly as the aircraft left the vicinity of the ship. This gave the ship's operator some problems. Reception in the plane was made difficult by the extremely high electrical noise level. There was little or no shielding and the noise from the magnetos, plugs, and generator was so terrific that one had to have a very strong incoming signal in order to copy through it. (That may have something to do with my now wearing two hearing aids!)

PREPARATIONS FOR FLIGHT. If a flight was to be made while the ship was at anchor or tied up at a pier, the plane usually would be lowered into the water by use of the ship's cargo boom. The Plane Captain would start the engine and warm it up with the plane on the catapult. When ready, the pilot and radioman would climb aboard. The pilot would strap himself in while the radioman stood on the rim of the cockpit to grab the large hook lowered from the cargo boom and hook it through a steel cable "sling" on top of the plane's center-section. Once hooked on, the plane would be lifted off the catapult and, with the engine idling, would be swung out and lowered into the water. Several men on deck used long bamboo poles to keep the plane headed away from the ship during the lowering process. Once the plane was in the water the radioman climbed up on the cockpit rim again and unhooked from the cargo boom. This done, he would tap the pilot on the head to indicate "all clear" and strap himself in for taxi and take-off. Most times the taxi was uneventful; but once in a while the engine would quit when the pilot tried to accelerate it, and would have to be restarted. And starting an engine while the plane was in the water was a real chore. As was mentioned earlier, the engine had a hand-cranked inertial starter. This meant that someone had to climb up to the side of the engine, two or three feet behind the propeller, put a crank on a shaft protruding through the fairing, which shaft was connected through a system of gears to a relatively heavy flywheel, and then start cranking with ever increasing speed. When the flywheel was spinning as fast as the cranker could make it go, he would inch back to be clear of the propeller and nod to the pilot, who would have been watching over the side of the cockpit. The pilot would engage a clutch connecting the spinning flywheel to the engine and the engine would begin to rotate. If it fired and caught, you had it made. If it did not catch, you would climb back up and repeat the process until it did. Cranking an engine while on the ground or on the catapult was not too bad. One could stand on a stepladder. But to crank one while on the water without dropping the crank overboard, falling overboard yourself, or getting hit by the prop, took the agility of a monkey and the sure-footedness of a mountain goat!

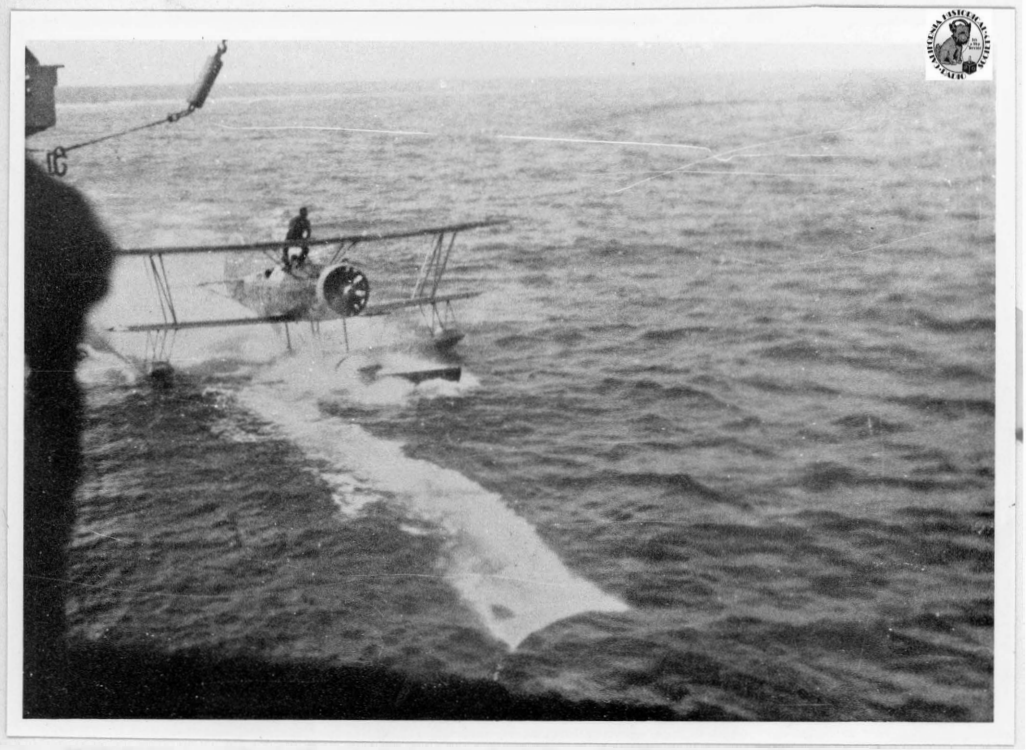
A catapult shot was quite something else! These were almost always made while we were underway at sea. The

"aviation gang" always was notified in advance of planned flight operations and were well prepared by the time the bugler sounded "Aviation Call" and followed it immediately by the "Man the Whaleboat (crash boat)" call. When those calls were heard practically everyone not on duty would rush topside to see the shot. Aviation was relatively new then, and while I am sure that no one really wanted us to go into the drink, all hands sure as Heck wanted to be where they could see it in case we did! Bets were made on the shots, and I understood that a considerable amount of money changed hands after each one.

The pilot and the radioman would climb into the cockpits, make a final check of gear, including a run-up of the engine, and strap themselves in tightly. The catapult would be trained out until it pointed a few points off the bow. In the meanwhile the ship would have been building up speed and would be making around thirty knots. Suddenly "Baker" flag (now Bravo) would be two-blocked on the signal halyard to notify other ships that we were about to launch, and the catapult officer, who was connected by phone with the bridge, would start swinging his arm in a circle over his head. That was a signal to the pilot to push the throttle wide open and hold it there, which he did. It was also a signal to both of us to put our heads back against the headrests and stand by for a very hard kick in the pants. The ship would turn sharply into the wind and, just as the ship started a roll that would bring the end of the catapult highest above the water, the catapult officer would release air under great pressure into the cylinders of the catapult mechanism. We would be snapped violently back against the seat, and there would be a blur as the car bearing the plane rushed the length of the short track. There would be a heavy thump as the car struck the snubbers and stopped. We kept going. Unless there was an unusually strong wind the plane would drop sharply as it left the catapult. For the first few shots I thought we were going into the water for sure, but then I found that when we got within ten feet or so of the water we seemed to hit some sort of air cushion that stopped our drop and let us stagger along until we picked up enough speed to fly comfortably. "Ground effect" I believe it was called. People who did go into the drink because of a "slow shot", or other reason, usually were picked up without serious injury, unless the plane was run over by the ship.

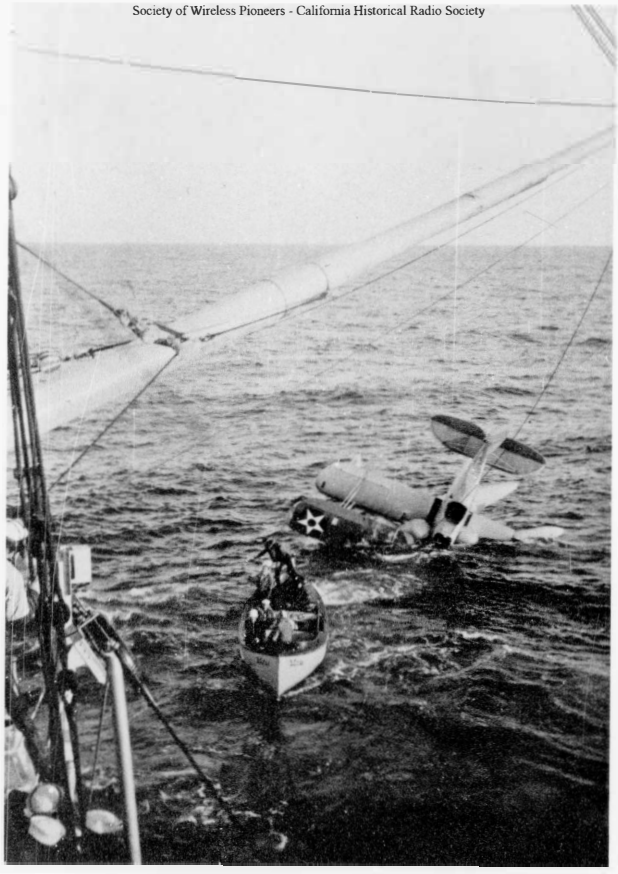
GETTING BACK ABOARD. There were several methods of recovering aircraft, some simple, others not.

When the ship was anchored, and the wind and currents were right, the cargo boom would be rigged out and the hook, with a short length of line tied to it, would be lowered enough that I could reach the line when standing on the rim of the cockpit, but still high enough to allow the plane to pass under it. The pilot would taxi parallel with the ship's side until under the hook. I would grab the line, pass it through



Making a Net Recovery, Gulf of Mexico, 9-29-1934
Ship doing twenty knots
LtCdr. Dixie Kiefer, Pilot - - A.A. Gray RM2, standing

Society of Wireless Pioneers - California Historical Radio Society



Not one of our better recoveries!
(Nobody was hurt---just wet!)

our "sling" and then work the sling over the hook proper. We then would be hoisted up and set on the catapult car. A variation of this involved the use of a line-throwing gun. It too was used while the ship was in port, and when strong winds or currents existed. We would taxi into the wind up to within a hundred feet or so of the ship's lee side and then reduce power to the point where we could just maintain position. A bos'n's mate would then use a conventional line-throwing gun to shoot a line to us. Once we had the light line aboard I would pull out a heavier line and attach it to the main float. The deck crew would then play us like a fish until they worked us under the cargo boom, where I hooked on in the usual manner. The bos'n's mate was pretty good with that gun and could usually lay the line over the wing or across the cockpit area. However on one or two occasions he got a bit low and threaded the line right through the rear cockpit, in one side, out the other, nearly skewering me in the process.

Once in a while, after landing in the vicinity of the ship it would not be practicable to either taxi under the hook, or go close enough to use the line-throwing gun, in which case we had to call for a boat. The radio could not be used while the plane was on the water (no antenna, and no power if engine not running). So in this case resort was made to visual signaling. I could not read semaphore signals but had learned to send a few phrases such as "send boat", "need mechanic", etc. I could read searchlight signaling quite well. Accordingly, I would stand on the rim of the cockpit and wave my arms in the "attention" signal. Someone on the bridge always had his eyes on us and in a moment a searchlight would be trained on us and I would be given the "go ahead" signal. I would semaphore "send boat", and receive the reply by light. This "cross channel" communication continued until the whaleboat arrived and heaved us a line. The boat would tow us under the cargo boom hook, where we would hook on and be hoisted out in the usual manner.

I have written about the hooking-on procedure as if it was a simple, easy-to-do thing, but as a matter of fact it could be pretty "hairy" at times. The hook itself was heavy, and a few feet above it was a fitting that must have weighed 75-100 pounds. When the ship was rolling the hook went up and down like a yoyo despite all the winchman could do. At the same time the plane was bobbing up and down with the waves. Under these conditions the radioman, balancing himself on the rim of the cockpit with his waist against the center section, had his hands full in getting the loop of the sling over the hook, and holding it there until the winchman had taken a strain on it, and at the same time preventing the hook from going through the wing. It was awful easy to get a hand caught between the sling and the hook, and several radiomen I knew lost fingers that way.

In most recoveries at sea the ship would stop and we would

make a full-stall landing in the open sea close to it. A whaleboat would put a line on us and tow us under the hook and we would be hoisted in. Sometimes, if the seas were running particularly high, the ship would speed up to around 20 knots then reverse two engines on one side and put the rudder hard over. This caused the after end of the ship to slew around, knocking down the waves and creating a sort of "slick". We would land on that slick, and by using the engine, would keep the plane headed into the seas until the ship could slow down and come back for us. This wait usually induced seasickness in the "saltiest" of us!

The recovery system that made True Believers out of pilots and crewmen alike, however, was the so-called "net recovery". In this system a boat boom, which was thirty feet or so long, was rigged out horizontally from the side of the ship, and at right angles to it, at a point a bit forward of amidships. A long and fairly heavy line was run from the deck, through a block at the outboard end of the boom, and down to a "sea sled", to which it was secured. The sea sled was a wooden affair that looked like a very wide toboggan with one side of a rope cargo net fastened to it. When towed from the end of the boom the sled would slide along the surface of the water and keep the cargo net spread out flat behind it. The main float of the plane had a hook-like device fastened to its front end, especially designed to hook on to the cargo net when the float was run up onto it. The idea was for the ship to maintain a steady course at about twenty knots, making a slick as it went. The sea sled would be put overboard and streamed back about under the cargo boom hook; the plane would land on the slick as close behind the sled as possible, and while still on the step, taxi like Hell until the main float was over the cargo net, then reduce power enough that the float would lower and its hook engage the net. Once it was determined that the plane was hooked firmly to the net the engine would be throttled back to idle and the deck crew, using the line to the sea sled, would work the plane under the cargo boom where it would be hooked on and hoisted aboard, the ship all the while maintaining its speed of about twenty knots. It sounds simple, but in practice it didn't always work out that smoothly. The pilot had to maintain maximum control of the plane during touchdown (we would be landing very close to the side of the ship) and also had to keep it on the step in order to taxi rapidly. For those reasons he would come in quite a bit faster than the usual landing speed. That meant that if we happened to hit a swell at the wrong angle and bounced, the bounce would be a king-sized one. I recall one time we were attempting to land just off the after quarter on the port side; we hit hard and bounced way up. The pilot rammed the throttle full forward in an attempt to regain flying speed but was too late. We staggered across the ship, just clearing the after turret, and plopped into the water on the starboard side. That bent a few struts! There also was the matter of controlling the plane on the water so that it could hook onto the sea sled.

The nose of the plane would be high while taxiing so the pilot was unable to see the water directly in front of him. To compensate for this, just as soon as the plane was in the water the radioman would climb up where he could see over the center section of the upper wing and guide the pilot onto the net by a crude system of signals. Patting the pilot on top of the head meant "keep going straight ahead"; on the right side of the head meant "move right", etc. How hard you "patted" indicated degree of action desired. Sometimes when more power was needed to catch up with the sea sled I would be pounding the top of the pilot's head pretty hard. The only time I could strike a Commissioned Officer with impunity! When we were over the net I would draw my finger across his throat as a signal to throttle back to idle. Hooking on to the cargo boom while underway probably was easier than with the ship dead in the water because both the ship and the plane were steadier, i.e. the ship did not roll as much, and the plane did not bob up and down as much. One had to be very careful however not to move out on a wing far enough to cause the tip of a lower wing to dip into the water. If that happened the plane would capsize immediately, and as it took a few moments to cut the sea sled loose from the ship, the plane would be badly damaged. The floats would prevent it from sinking however. There was a lot of spray associated with a net recovery and both the pilot and the radioman, particularly the latter, would be completely soaked by the time they got back aboard ship. (Part of the wetness may have been due to perspiration, at least in my case!)

The job of radioman in this kind of aviation was not for everyone, but I really enjoyed the time I spent in it. Things were always popping up to make it interesting. I recall that once our division of ships was approaching San Diego after having transited the Panama Canal, and was conducting exercises enroute. As usual the planes were scouting out ahead and considerable radio traffic was handled between the planes and the ships. When the exercise ended the two aircraft from my ship were cleared to go on in to N.A.S. North Island (San Diego) and wait for the ship there. When we stepped ashore a messenger met us and said the Captain (John Towers) wanted to see us in his office immediately. When we arrived in the office we found there, in addition to the Captain, two very irate civilians. It seemed that the frequency assigned to us, and which we had used all during the exercise, was the same as that of the major broadcasting station in San Diego, and that we had completely fouled up the programming of that station for most of the day. We, the crews, were not considered culpable but the Navy as a whole took a lot of flak.

Another time we were over Point Loma (San Diego) when my antenna wire broke and about 200 feet of wire with a six-pound weight attached fell free. There was plenty of wild land on which it could have fallen but fate decreed that it land on the playground of a school. Fortunately classes were

in session at the time and no one was on the playground so there were no injuries. However parents were justifiably upset and the newspapers made a big thing out of it. This resulted in a series of investigations which led to the establishment of a corridor through which planes must pass when crossing the Point. On another occasion while we were practicing dive bombing the pilot's seat collapsed as he started to pull out of the dive and dumped him on the bottom of the cockpit. There were a few tense moments for both of us before we could get the plane out of the dive and leveled off.

On still another occasion I went up over Long Beach harbor with a Chief Aviation Pilot (also an enlisted man) to tow a target for ship anti-aircraft gun pointing drill. The target was a long tube of silk a couple of feet in diameter at the end of several hundred feet of line. The line was faked onto a board mounted under the lower wing and was held in place, along with the folded target, by pieces of elastic bungee. Once at altitude the bungee would be tripped and the target would stream out and be towed from a strut between the fuselage and the main float. On this particular day when the target was tripped and started streaming out, the line whipped up and caught in the crack between the lower aileron and the wing proper. This put the drag of the target so far out on the wing that we could no longer fly straight ahead but skidded in large circles. The pilot did everything he could think of to break the line loose, but to no avail. We knew we could not land in that condition, and neither of us wanted to jump, so it was agreed that I would climb out on the wing and see if I could work the line loose. We had on board a thin pole about five feet long that was used to hold a flare and keep it away from the side of the plane when lit. By lying on my stomach and hanging onto the flying wires I was able to wriggle far enough out on the wing that with the pole I could reach the hung-up line. It took only a few pokes with the pole to break the line loose and the target towed from the strut, as it was supposed to do. We completed our towing job without further incident.

In addition to being interesting, aviation radio operating paid a bit better than general service. Theoretically anyone who was required to fly was supposed to have "flight orders" (commonly called "skins") and was entitled to extra pay equal to 50% of his base pay. This however was at the depth of the depression and money was very short. Consequently we had only one set of "skins" for non-pilot personnel per plane per month. This set was rotated among the Plane Captain, the Ordnanceman and the Radioman, which meant that every third month I received the grand amount of $108.00 instead of the usual $72.00. In those days of "All you can eat for 35¢" and beer at a nickel per mug, this was almost like being a millionaire!

When my enlistment expired in March 1935 I left Cruiser Avi-

ation for a more prosaic job as Flight Radio Officer in the Pan American Clipper Flying Boats then opening the transPacific service. About a month after leaving the ship, I saw in the paper where the plane in which I usually had flown had lost its wings in a dive, killing both my replacement and the pilot with whom I usually had flown. It gave me a very strange feeling!