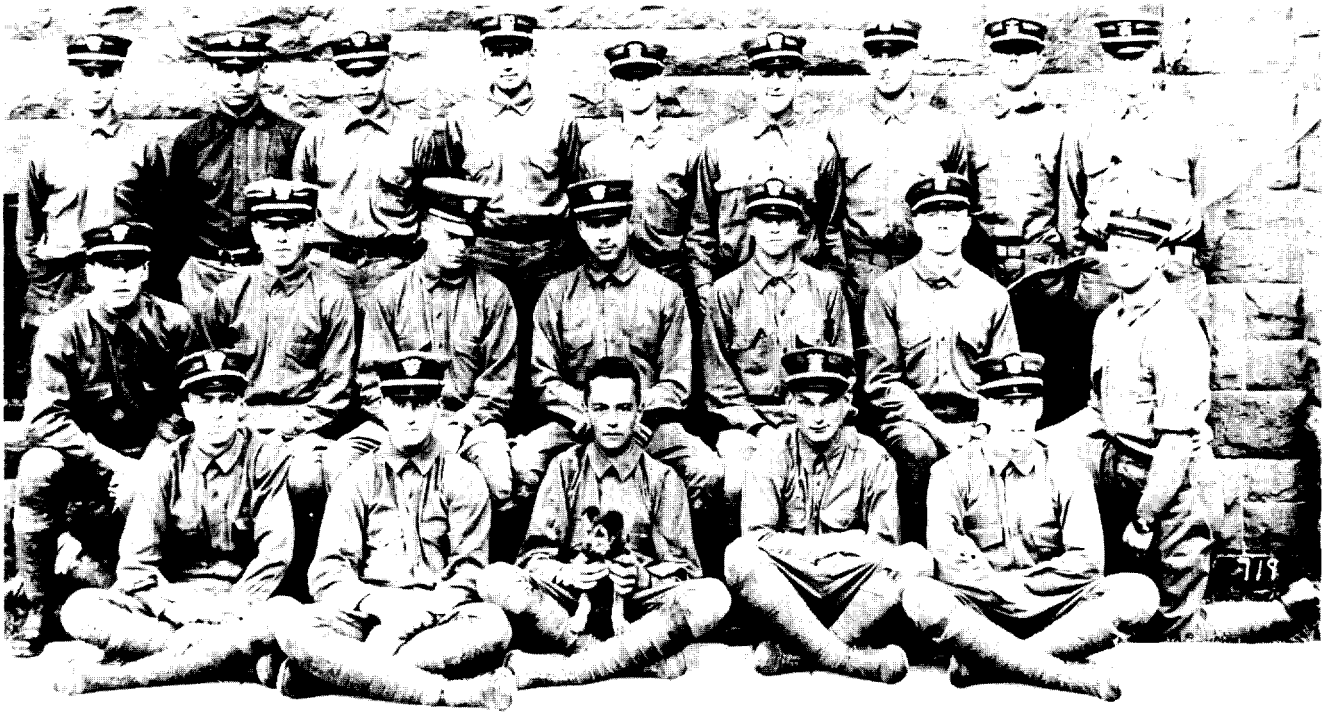


TWENTY-ONE *of the 24-man contingent: Front row: Frothingham, Butler, Wright, Swift, Warburton; middle row: Zunino, Randolph, Mudge, Gordon, Read, Breckenridge, Matter; back row: Forrestal, Shea, Goldthwaite, Chapman, McCoid, Halstead, Tenney, Clarkson, McCann.*

TRAINED BY THE ROYAL FLYING CORPS

By J. Sterling Halstead
Naval Aviator No. 160

AN INTELLIGENCE mission* could hardly have departed with less fanfare. Only the gold braid on the naval officers' caps was conspicuous, although the naval khaki uniforms looked a bit like Theodore Roosevelt's "Rough Riders." They came through Boston's old North Station singly and in groups of two or three and disappeared into the semi-darkness of the train shed outside.

Mostly strangers to each other, the 24 men found their billets in the last car of the Montreal Express. So began the mission of the group that later came to be known in United States Naval Aviation as the "Canadians."

We had expected to go to NAS SQUANTUM, Mass., but instead we had been ordered to active duty with the Royal Flying Corps at Toronto.

The detachment was made up of 11 Princetonians: Gavin Breckenridge, William F. Clarkson, James V. Forrestal, Harold F. Gibson, Harry B. Gordon, Robert Matter, Richard H. McCann, William F. Mudge, Edward L. Shea, William J. Warburton and Frank A. Zunino. The two ensigns in command, Frederick S. Al!en and Francis I. Amory, were from Harvard as were Duval R. Goldthwaite, Paul S. McCoid and Duncan H. Read. I was a 1916 graduate of Yale and had entered Harvard Law School. Philip B. Frothingham was from Dartmouth and Stuart M. Butler, Thomas H. Chapman, Arthur H. Wright, Rettig A. Griswold, Henry Swift and Robert D. Randolph had college affiliations which I do not recall.

The first time we assembled at the University of Toronto parade ground for drill, the Commandant of the Ground School greeted us and asked whether we had among us anyone who could instruct us in drill. Our replies being negative, Sgt. Sedgewick, a typical Rudyard Kipling soldier from the Coldstream Guards, was appointed our drill master.

We were told to take notes on everything so that we could bring back to the U.S. Navy complete information on the subjects taught, the equipment and the methods used. The first day, however, all we took back to our barracks were very sore feet and very tired muscles.

After two weeks of putting in long hours on the parade ground—four to six hours a day—we were all in wonderful shape. We finished our training with a lasting affection for Sgt. Sedgewick.

* Under the title of "A Mission to the Royal Flying Corps," J. Sterling Halstead, Naval Aviator No. 160, wrote for the U.S. Naval Institute Proceedings, February, 1965, pp. 78-94, a detailed account of the training in 1917 of young candidates for Naval Aviation Wings. This article describing training in Canada is a précis of that account. The pictures are taken from the collection of Harold F. Gibson, Naval Aviator No. 156.

The drilling and ground school lectures and classes crowded our days through July and August. We were taught theory of flight, rigging, engines, machine gunnery, bombing, aerial photography, meteorology, instruments and astronomy. We listened with rapt attention to Canadian and British officers with combat or front line experience.

We were thoroughly schooled in the Lewis and Vickers machine guns by noncommissioned officers. We learned to live with the guns, to break down and reassemble them at top speed, to clean them and to recognize and correct various types of jams to which they were subject. We came to understand the workings of the various types of aerial gunsights then in use, but our firing experience was deferred until we reached the advanced flying school in October.

"Artillery Observation" was the now well-known system of reporting and directing artillery fire by "wireless," as the RFC called it, from the air. In the ground school, the cadets had the benefit of a mock-up of a landscape showing a battlefield with a seat for the pilot hung high above and fitted with a sending key. A system of lights on the map below simulated the results of artillery fire. The spot, where each shot "struck," was reported by wireless key and checked by the instructor.

In the engines class, we examined and, in some cases, took apart and reassembled various types of aeroplane engines, including the English Daimler, the American Curtiss, used in training airplanes in Canada, and the French Clerget and *Gnome* rotary. Our lectures covered the design, material and working of the carburetor and magneto, the timing of engines, theory and practice.

In the class in rigging, we learned in detail how aeroplanes were constructed from specimens of wings from planes that had crashed. We learned to mend the holes in fabric, by sewing, patching, and then painting with aeroplane varnish.

The theoretical side of flying was presented in lectures. We learned why an aeroplane flew and how it was controlled, plus a glossary of new terms. The classes in bombing, aerial reconnaissance, contact patrol and map reading were all closely related to operations on the Western Front.

OUR ONLY recreation during this period was to walk downtown in Toronto after our work day was over. The city was full of men in uniform, many of them RFC cadets as well as Canadian ground troops. The spectacular officer's uniform was notably missing, however; the officers were allowed to wear mufti when off duty to avoid constant saluting.

Our naval officers' caps brought us immediate attention. We were tagged the "American Naivy" by the British soldiers and the name stuck to us until we returned home.

One effect of our evening ramblings was to convince us that we were badly dressed compared to the RFC cadets. Our officers had tried without success to get some information from Washington about our own winter naval aviation uniforms. We decided to do something about the situation ourselves. The prime mover in obtaining uniforms was Jack Warburton of Princeton, a member of the Wanamaker Clan.

The name of the tailor selected, as I recall, was "Follet & Sons." The uniforms were of green gabardine, as the Navy had indicated that the naval aviation winter uniform was to be green like that of the Marines. As several of us had tried to have our khaki summer uniforms copied with strikingly unsatisfactory results, we were forced to decide on the British jacket or "tunic" as they called it, with a flaring skirt and belt. The belt did not have the shoulder strap like the Sam Browne belt but we added that just before leaving Canada. With the naval officer's hats equipped with green gabardine tops, our outfit might have passed for "Florenz Ziegfeld Aviators."

Our uniforms were finished just before the end of August, when we had expected to be leaving for flying camp. But there was not room for us at any flying camp, so we were sent to Longbranch on the lake shore some miles southwest of Toronto where we were quartered in tents. We stayed there only a week. Soon we were again on a train, bound for a flying camp in eastern Ontario at Deseronto, about 40 miles from Kingston.

Upon arrival, we stood on the station platform awaiting orders. Aeroplanes were coming and going overhead, motors roaring and wings flashing in the sunlight as they banked and turned. It was a new and fascinating world. Upon arriving at Camp Rathburn, we wandered down to the hangars and spent the greater part of the afternoon watching flying operations. Some of the Canadian officers began taking us up on what was known as our "joy hop."

After taking off and climbing well above the field, the RFC pilots would make a few sharp banks, standing the ship first on one wing and then the other, then turn back to the aerodrome, coming in for a landing in a steep dive. It was over almost before we knew it had happened. I staggered away toward the hangar a little dizzy after my flight. Nearly three weeks passed before we were off the ground and in the air again.

THERE WAS always a shortage of aeroplanes, owing to crashes which in many cases did not injure the pilot but always put the aeroplane out of use for a minimum of several hours. This shortage was aggravated by the fact that, after soloing, student pilots were allowed to wander all over eastern Canada and sometimes landed so far away from camp that it took several days to truck the plane back.

One of the Canadian cadets, a stocky little American from Louisiana named Winkler, was ordered by an 18-year-old British lieutenant to take a plane up and stay three hours. He attempted to do just that. We had all been instructed that gas tanks in Curtiss trainers held only enough for two and a half hours' flying. Winkler somehow managed to stay up three hours and five minutes, then made a forced landing in a field full of boulders without even blowing a tire. To compound the errors, however, the "leftenant" took off with Ed Shea in the front seat and flew over to survey the situation. When he attempted to land, he hit a boulder with one wing. The crash gave Ed some minor cuts and bruises. Both aeroplanes had to be dismantled and trucked back to camp, a process which took days.

Instructors were finally assigned to us and our flight training began. When my instructor, Lt. Goldstein, indicated that he thought I was ready to solo, he was more confident than I was. That night a black cat crossed my path and, for the first time in my life, I was disturbed by it. But the insignia of our squadron was a black cat and

apparently both of them were good luck because I soloed without mishap.

On the first solo flight, our cadets experienced a sort of monotony of tension. This was described by Randolph after his flight, "I sat up there for two hours waiting for the tail to fall off." There were many things we knew could happen but they never did.

Of course, we had our share of crashes: Tom Chapan managed to land nose first, but with tail almost perpendicular, on top of one of the hangars. He was not even scratched. Getting him down without upsetting the aeroplane on top of him, however, was a precarious job.

Jim Forrestal, who was both capable and careful, at first found it exceedingly difficult to make landings. He broke the back of one plane, demolished the undercarriage of another, and spoiled a third, fortunately without any injury to himself. After that, he had no further difficulty.

We had to learn to fly entirely by "feel" as we had no instruments except an altimeter and a "rev counter" showing the speed of the motor. We learned by watching and following the instructor's use of the controls. The members of our unit soloed after periods of dual instruction that ran from a maximum of six hours to a minimum of 45 minutes compared with the ten hours dual then required in the flying schools of the U.S. Army and Navy.

Fortunately, even the worst crash that any of us had did not result in an injury. One afternoon during our last week at Deseronto, an aeroplane came in just over the tree tops. We expected the pilot to land (though he was coming in crosswind) because one wing was drooping and the motor was missing badly. Instead, he made an uncertain turn off the field, flew over a barn, missed a silo by a few feet and disappeared. A quick check showed that the pilot was Floyd Clarkson.

Again Clarkie came in, executing the same maneuver in an even more shaky fashion. This time, however, he did not return and the sound of his motor died out quickly beyond the trees. At this point the black ambulance which we called "Hungry Liz" dashed down the road. None of us expected to see Clarkie alive.

An agonizing hour passed. Then up came "Hungry Liz" and out stepped Clarkie unscratched, looking for all the world as if he had been to Eternity and back. He had ended his strange flight in a flat tailspin which caused the aeroplane to collapse into kindling wood as it struck, leaving the pilot unhurt in the middle of the pile.

GORDON *and Read, Naval Aviators 151 and 145, model two types of uniforms they wore.*

One day we had word that we were expected at the Camp Borden Advanced Flying School on October 1. It was also rumored that if we finished our requisite 50 landings and ten hours of solo time sooner, we would be granted leave to go home in the meantime. Since I needed only four hours to finish, I decided to get them out of the way at once. I easily put in two hours in the morning, but in the afternoon, I found that the only aeroplane was a new Canadian Curtiss JN4, then in the process of being assembled. By four o'clock, I obtained permission to take it up.

It was a wonderful little aeroplane and extremely pleasant to fly compared with the somewhat exhausted JN4B's we had been using. I turned east along the lake for a while, then north, and then headed for camp. After several of these laps, I noticed the sun was getting low over the horizon. On one pass, I saw the lights coming on at camp and in Deseronto, but the sky was still light.

Watching the night come on was so engrossing that I overlooked the significance of what I was seeing. Suddenly the light in the west vanished and darkness crowded in. I was several miles east and north of the camp when, without warning, my engine, which was new and stiff, sputtered once and stopped dead. I must have been about 1,000 feet above the trees.

There was no time to think. From some newborn instinct, I pushed the nose of the aeroplane over into a steep dive. The treetops were coming up faster when, miraculously, the motor started. The air pressure on the propeller generated by the dive had cranked the engine.

I headed for camp, circled once and, seeing a motor lorry with its headlights showing up a few yards of grass on the field, was able to land with no trouble at all. It was just six o'clock. I had completed my ten hours and was ready for leave.

When I returned, our unit was sent north by train into the Georgian Bay and Lake Simcoe country to the advanced flying school.

THE WEATHER was always cold and windy during our stay at Camp Borden. On some days, it blew so hard that the underpowered Curtiss training aeroplanes were badly tossed about. We were constantly on the edge of trouble in turns at low altitudes near the aerodrome and in making landings, avoiding sideslips and spins.

On one of the first flights I made at Camp Borden, coming back to the field, I nosed over a few miles from camp to lose altitude from 2,000 feet. The aeroplane, which was rigged nose heavy, dropped out from under me so quickly in an almost perpendicular dive that I had the sensation of falling at lightning speed minus an aeroplane.

On another occasion, McCoid and I were slated to fly to Toronto 70 miles away. A strong wind was blowing, and when I took the aeroplane assigned to me up to try the air, the wind nearly turned it over. Much to the displeasure of our Canadian Flight Commander, I concluded it was too rough to make the trip that day.

McCoid took off after a time but had to make a forced landing near Lake Simcoe, far off the course to Toronto. He did not get back to camp for two days. A Canadian cadet took my plane and crashed so badly that he lost the sight of both eyes.

The threat of a forced landing was the hazard most constantly present in our minds at Borden as it had been in Deseronto. At Borden, however, the course included some preparation for such a contingency. We were required

to make landings in a 50-foot circle, cutting the motor at a stated altitude, and our performance was checked by our Flight Commander. Whenever a cadet was in the air and had the opportunity, he was apt to hunt for a spot to try such a landing. It was good practice and, besides, landing in a farmer's field had an attraction approximating an appearance in a circus parade.

Some daily flying was devoted to formation, but this was largely a gesture; some, to climbing for the altitude test, 8,000 feet. The hazard of the latter was that the JN4 sometimes stalled as it approached that height, and as none of us was given training in stalls or in spins which might follow, those cadets who experienced either were apt to do the wrong thing. So far as I can remember, the only remedy given us for a spin was reverse rudder and aileron, which did not agree with the theory later taught us by the U.S. Navy—to put the controls in neutral. I recalled this argument in the spring of 1918 as I spun a Navy Burgess seaplane into San Diego Bay.

The remainder of the 40 hours flying required to finish the course was devoted to bombing practice, artillery observation and aerial gunnery.

Bombing was the easiest. The RFC had a ground support device consisting chiefly of a mirror in which the bombing plane was reflected. The bombing pilot sent down a "wireless" signal in lieu of releasing a bomb and the enlisted man watching the mirror could determine from the position of the reflection of the aeroplane whether the bomb would have hit the target.

Artillery observation consisted of flying figure 8's over a tent several miles from camp and reporting the location of puffs from small smoke bombs previously laid out and fired by an enlisted man. The report by the pilot was sent by wireless in the now well known "clock code." As the Curtiss JN4 had no compass, confusion was easy.

Aerial gunnery training on flexibly mounted Lewis guns was given to pilots riding in the training aircraft as passengers along with cadets being trained as observers. The Canadian pilots flying these gunnery hops were volunteers, probably because it was regarded as a suicide profession. Two pilots would often put themselves into difficulties by maneuvering their planes in simulated combat. A camera device, which took a single still picture when "fired," produced a print showing whether the gunner's aim would have scored a hit.

The other part of aerial gunnery training, actual firing at a sleeve target towed by another aeroplane, was carried out with Lewis guns on flexible mounts bolted to the top wing of the gunnery plane. The cadet fired from a standing position in the rear cockpit. The pilot of the tow plane crossed the flight of the training plane at a right angle and sufficiently ahead to give a clear chance for a burst of fire at the sleeve target without the tow plane coming into the line of fire. This could be hazardous.

No safety belts were provided for the cadet, so that as soon as I spotted the target approaching from the right, I stood up in the rear cockpit and started firing. It was a long reach, lengthening as the target got further away. Without intending any gymnastics, I climbed up until I was standing on the rear seat. As I followed the target, suddenly the towing ship and its pilot appeared in the middle of my ring-sight and I found my gun aimed point blank at his tail. Fortunately nothing happened, and I hastily turned my gun away and slid back into the seat. That night I expected at least there would be rumors of bullet holes in the towing ship, but I heard none.

Just before we finished the course at Borden, Ens. Fred Allen told us that we were going to be instructors in the U.S. Navy's flying schools. At the end we wrote reports on various phases of our training.

'PETE' GIBSON *with favored leather helmet over steel lining; note black cat insignia.*

It was still October when we returned to the Boston Navy Yard. The brass on our hats and the bright green of our uniforms seemed to look brighter and more conspicuous in the autumn sunshine of Boston. As we swung by the Marine sentry at the gate, with clicking heels and our Sam Browne belts and British open-collared tunics, we heard a bystander remark that we were a detachment of the Italian Navy.

At the door of the building where we had received our orders in July, we halted and broke ranks never to form again. But the mission was not ended. A new and far more important phase was soon to begin.

TOWARD the end of November, our commissions and orders came through. We were divided between Bay Shore and Hampton Roads Naval Air Stations to qualify on seaplanes and flying boats, which required only a few days, and then we were scattered.

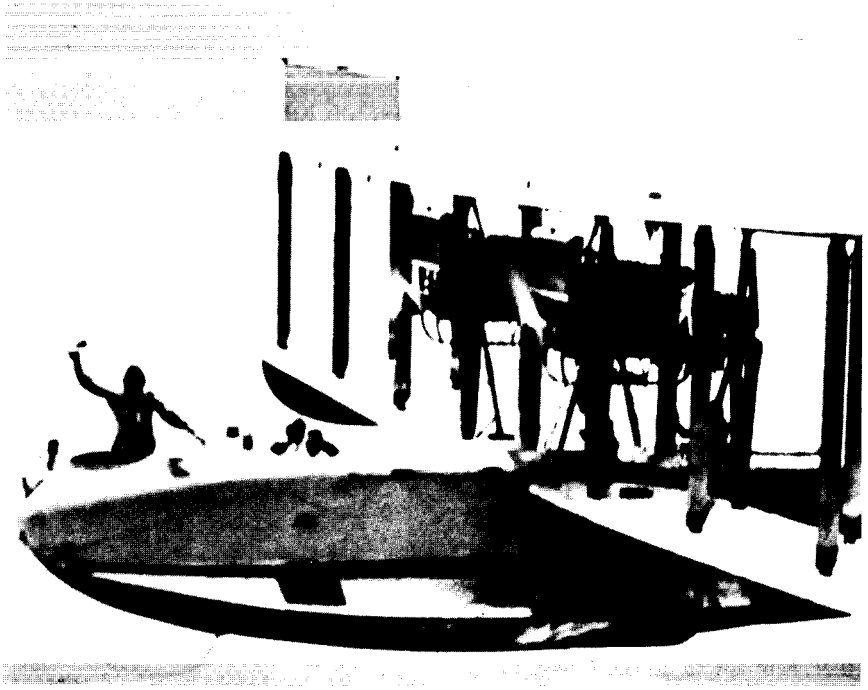
The largest contingent from Bay Shore, including Allen, Gibson, Gordon, Clarkson, Swift and others, went to Pensacola where they developed an advanced flying and aerial gunnery school patterned after Camp Borden. Duncan Read was soon sent to Miami and remained in command there until the Armistice.

Breckenridge, Butler, Frothingham, McCann and Wright were sent to stations in England and France; Frothingham and Wright never returned. Ed Shea and I were ordered to San Diego, Calif., where, with Ensigns A. K. Warren and Bert Ames, Naval Aviators trained at Pensacola, we joined with LCdr. E. Winfield Spencer, then commanding officer of an air mechanics school located in Balboa Park, in founding NAS NORTH ISLAND. Our only other claim to distinction from that duty was the privilege which we enjoyed of dancing once on Saturday nights, at the Hotel del Coronado, with the C.O.'s wife, now the Duchess of Windsor.

Jim Forrestal, with Goldthwaite, was sent to the Navy Department in Washington to help in the task of spreading the lessons learned and the material brought back from Canada. There he worked under the Assistant Secretary of the Navy, Franklin D. Roosevelt, who, years later, would appoint Jim his Secretary of the Navy.

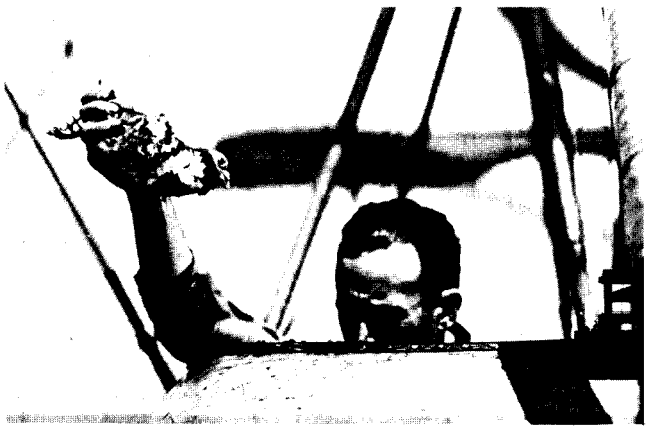
Pigeons . . .

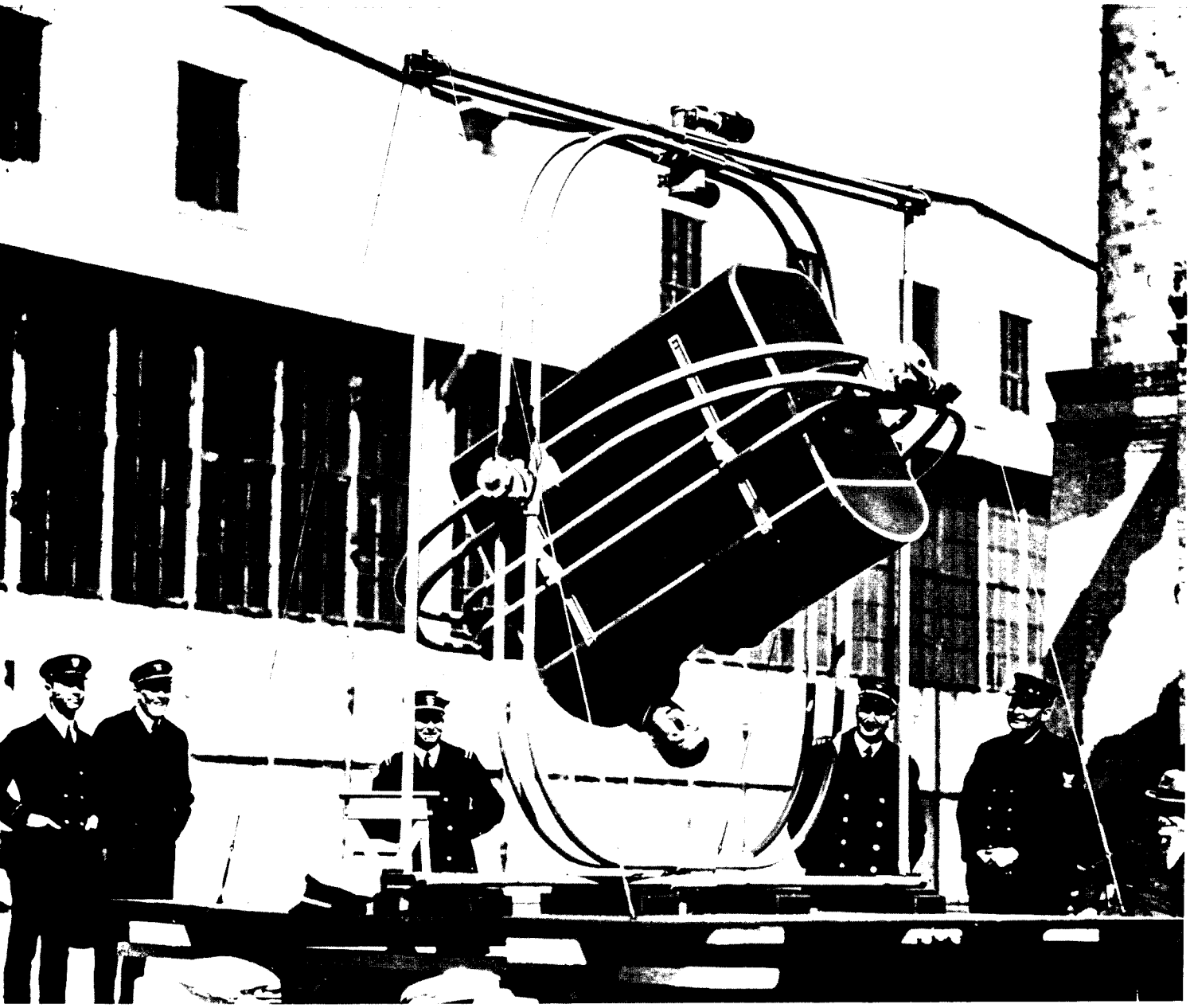
829 trained pigeons flew 10,995 missions with Navy pilots, but carried only 230 messages from the planes – 219 successfully, with 11 messengers missing in action.

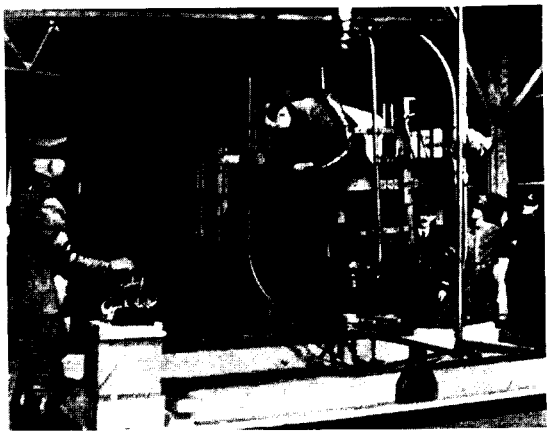


PIGEON-PITCHING FROM AN F5L

A U.S.-BRED *pigeon paced World War I birds with a record-setting 196 messages delivered from sea during the last year of the war. But the Navy's first carrier pigeons were of Belgian, French and British origin, obtained in a 1917-18 "lendlease" deal. "Peerless Pilot," shown in profile at upper left, was the record holder, bred at U.S. NAS Pauillac. Pilots were taught to throw the birds up or down to avoid props, depending upon the aircraft model, while the British tossed their birds in bags in order to minimize feather damage. Naval Air maintained 12 pigeon stations in France with 1,508 trained, young and in-training birds on hand at the time of the Armistice. On the cover, the white speck is a messenger leaving an HS-2 seaplane over the submarine-infested Bay of Biscay.*







. . . and Pilot Trainers

Gimbal-mounted orientators could provide the novice with sensations of flight variously described as “sailing, dipping, zooming and looping the loop.” Photos show fledgings being whirled about in all directions in the specially designed frames.

THREE MORE MONTHS: JULY, AUGUST, SEPTEMBER, 1917

In the second three months of WW I, the expansion program got underway. Although there was some evidence that those directing the expansion were profiting by the experience of our Allies across the ocean, their initial moves were both bold and imaginative in comparison with what had been done in aviation prior to our entry in the war. It was too early to see the results of their work or, in fact, how great the expansion would be, but the foundation laid in these months proved solid and sound for the growth that was to come.

JULY

4—The first eight-cylinder Liberty motor arrived in Washington, D. C., for test by the Bureau of Standards. It had been assembled at the Packard Motor Car Company from parts made by manufacturers in plants scattered from Philadelphia, Pa., to Berkeley, Calif. Design, manufacture, and assembly of this motor had taken less than six weeks.

9—Twenty-four potential Naval Aviators, with Ens, Frederick S. Allen as officer-in-charge, reported at the University of Toronto to start flight training under the Canadian Royal Flying Corps. Many of the group were from the Princeton Unit which had been in training at East Greenwich, R. I., while awaiting call to active duty.

10—A proposed system of training student officers of the Naval Reserve Flying Corps, which represented a radical change from the existing system, was circulated for comment. The program consisted of three parts: (1) a Ground School for indoctrination into the Navy and study of subjects related to aircraft and flight, (2) a Preliminary Flight School for flight training through five to ten hours of solo, and (3) a Completing Flight School for advanced flight training and qualification as a Naval Aviator and commission as Ensign, USNRF.

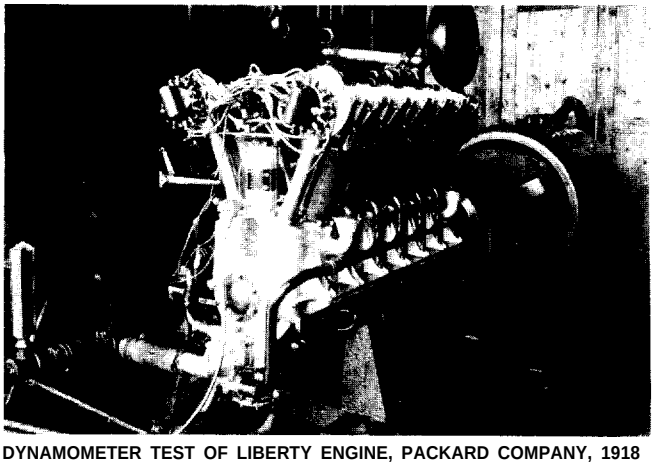
23—The ground-school at the Massachusetts Institute of Technology went into operation with the arrival of the first commanding officer, Ltjg. Edward H. McKitterick, and a group of 50 men comprising the first class (see NANEws, August 1967, pages 24-27). In this and in supplementary programs later established at the University of Washington in Seattle and at Dunwoody Institute in Minneapolis, large numbers of prospective aviators and ground officers were indoctrinated into the service and introduced to the fundamentals of aviation.

24—A large obstacle to the effective expansion of aircraft production was removed by the formation of the Manufacturers Aircraft Association to handle the business of cross-licensing patents between all aircraft manufacturers in the United States.

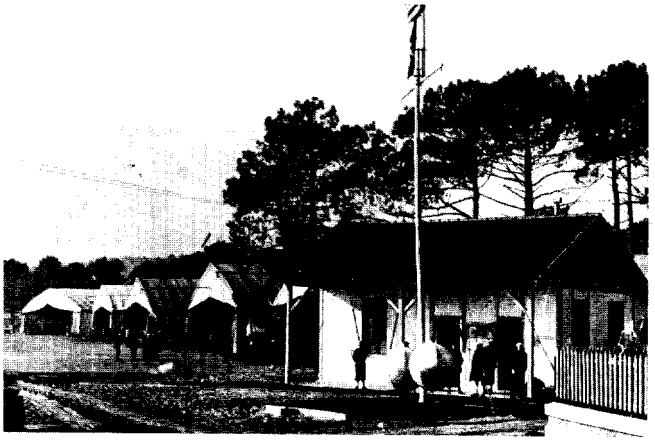
26—The Army-Navy Airship Board considered a proposal by the Bureau of Mines that the experimental production of helium be undertaken and, in its approval, recommended the allotment of $100,000 to construct a small plant for the purpose. This action, subsequently approved by both Departments, was the beginning of the helium production program in the United States.

27—An Act of Congress authorized the President to take possession of North Island so that the Army and Navy could establish permanent aviation stations and schools. The arrival of Lt. Earle W. Spencer on 8 November 1917, under orders to establish and command a station for the purpose of training pilots and mechanics and maintaining coastal patrol, marked the beginning of the present Naval Air Station, North Island.

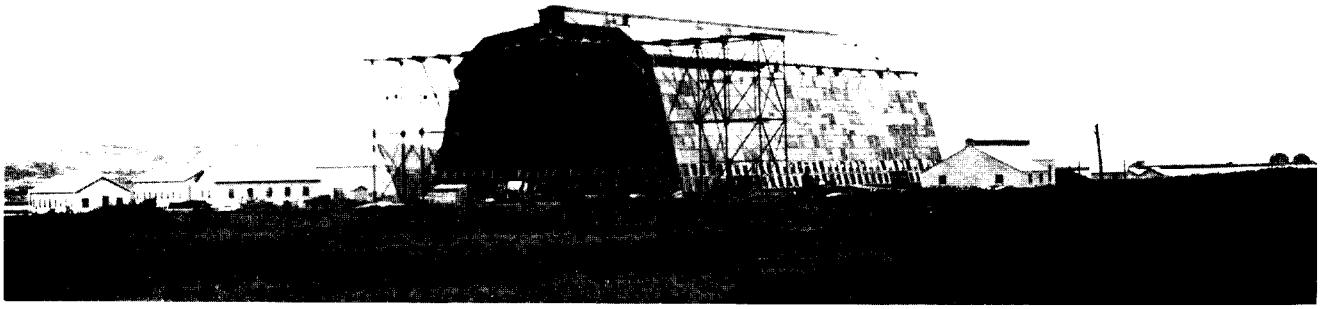
27—Construction of a Naval Aircraft Factory at the Philadelphia Navy Yard was authorized for purposes of constructing aircraft, undertaking aeronautical development, and providing aircraft construction cost data.



DYNAMOMETER TEST OF LIBERTY ENGINE, PACKARD COMPANY, 1918



SIGNAL FACILITY AT MOUTCHIC, A TRAINING STATION IN FRANCE



BY DECEMBER 1917, LTA FACILITIES HAD BEEN ADDED TO MONTAUK WHICH HAD BEEN COMMISSIONED AS A SEAPLANE PATROL STATION

AUGUST

8—The Secretary of the Navy approved the plans to establish one training and three coastal patrol stations in France, the first of several plans dealing with an overseas base construction program. This program was successively expanded and it ultimately provided 27 locations in France, England, Ireland and Italy from which naval air units were operating at the close of the war.

10—Ground was broken for building the Naval Aircraft Factory at the Philadelphia Navy Yard.

14—In a test conducted by Lt. Edward O. McDonnell at Huntington Bay, L. I., a torpedo was launched from a seaplane. It struck the water at a bad angle and ricocheted, nearly striking the plane. This test marked the beginning of serious Navy interest in launching torpedoes from aircraft. Later tests were made at Philadelphia.

16—The first students of the First Aeronautic Detachment to complete the flight course at Tours transferred to Lake Hourtin to begin training in F.B.A. flying boats.

25—Development of flying boats, later designated NC, was initiated by Chief Constructor David W. Taylor in a memo which outlined the general requirements of an airplane needed in war and directed his staff to make further investigation. Taylor stated in part: "The 'United States [Liberty] Motor' gives good promise of success, and if we can push ahead on the airplane end, it seems to me the submarine menace could be abated, even if not destroyed, from the air. The ideal solution would be big flying boats, or the equivalent, that would be able to fly across the Atlantic to avoid difficulties of delivery, etc."

25—The 12-cylinder Liberty motor passed a 50-hour test with a power output of 301 to 320 horsepower, preliminary to being ordered into mass production.

31—NAS MOUTCHIC, established as a flight and ground training station in France, was commissioned under command of Lt. John L. Callan.

In August 1917, NAS MONTAUK was commissioned with Lt. Marc A. Mitscher in command. Operated initially as a seaplane patrol station, facilities were later expanded to include lighter-than-air operations.

SEPTEMBER

7—In tests which led to additional orders for Simon radio transmitters, radio signals sent from an R-6 seaplane flying at Pensacola were received loud and clear by Naval Radio Station, New Orleans, over 140 miles away.

7—A forest green winter service flying uniform, of the same design as the summer uniform, was authorized for all officers detailed to aviation duty.

7—A winged, foul anchor was adopted as an official device to be worn on the left breast by all qualified Naval Aviators. Before the wings were issued, use of the letters U. S., which had been incorporated in the first design, was abandoned and the design adopted was essentially that of the wings worn by Naval Aviators today. Adoption of wings appears to have been responsible for compiling, in January 1918, the first precedence list of Naval Aviators, at that time numbering 284.

8—A site at the Naval Operating Base, Hampton Roads, was established as an air training station and patrol base and as a center for experimental work in seaplane operation. Detachments under training at the Curtiss School at Newport News and others at Squantum transferred to this location in October and, on 27 August of the next year, the Naval Air Station was placed in commission, LCdr. P.N.L. Bellinger commanding.

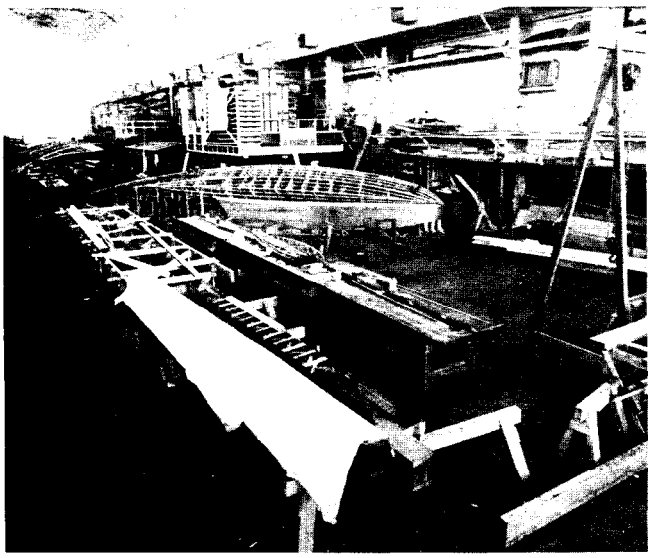
17—A kite balloon from USS *Huntington* was hit by a squall. While it was being hauled down to the ship, it struck the water so hard that the observer, Ltjg. H. W. Hoyt, was knocked out of the basket and entangled in the lines. As the balloon was pulled toward the ship, SF2 Patrick McGunigal went over the side, cleared the tangle and put a line around Lt. Hoyt so that he could be hauled up on deck. For this act of heroism, McGunigal was later awarded the Medal of Honor.

17—The Secretary of the Navy approved establishment of 15 naval air stations overseas to be in operation by 1 July 1918, each to be equipped for seaplane operations. Five of them were to have, in addition, facilities for operating airships and supporting kite balloon operations.

18—A production program of 1,700 operational type aircraft was established on the basis of a report issued this date by the Joint Technical Board of Aircraft.

26—Lt. Louis H. Maxfield, commanding the Naval Air Detachment at Akron, Ohio, reported the qualification of 11 students, including himself, as lighter-than-air pilots and requested their designation as Naval Aviators (Dirigibles). These men, the first trained specifically as dirigible pilots, were subsequently assigned Naval Aviator numbers ranging from 94 to 104.

27—Ens. Robert A. Lovett (later SecDef) made the first flight at NAS MOUTCHIC, France, in an F.B.A. seaplane, the assembly of which had been under his direction.



THE EXPERIMENTAL SHOP IN THE LAST SIX MONTHS OF THE WAR

THE PROPELLER SHOP OCCUPIED A LARGE SECTION OF THE PLANT

THE NAVY BUILDS AN AIRCRAFT FACTORY

Aircraft, bases and men were the three keys to success in the wartime expansion of Naval Aviation. Base construction, which began within a month of the declaration of war, would soon provide a network of stations to support operations on both sides of the Atlantic. Provisions for training large numbers of officers and men had been made and would shortly produce the much needed qualified personnel. Only the aircraft procurement problem remained. The prospect that needs would quickly outstrip the existing manufacturing potential made the situation urgent.

By Izetta Winter Robb

ONE OF THE NOTABLE achievements of Nval Aviation in World War One was the establishment of the Naval Aircraft Factory at Philadelphia.

Shortly after the United States entered the war in 1917, the Navy found it feasible to construct and put into operation its own aircraft factory. It appeared unlikely that existing aircraft plants in the country would be able to cope with the large orders being thrown upon them by the Army and the Navy. It seemed wise to the Navy, therefore, to consider building at once an aircraft factory under Navy ownership.

The Navy had three objectives in establishing such a plant: to manufacture at least a part of Navy aircraft under the direction and control of the Navy Department; to have a plant in which aircraft could be designed and developed under the close direction and supervision of the Navy Department and its bureaus; and to accumulate data by which the Navy could be guided in dealing with questions of cost arising out of contracts with privately owned aircraft factories.

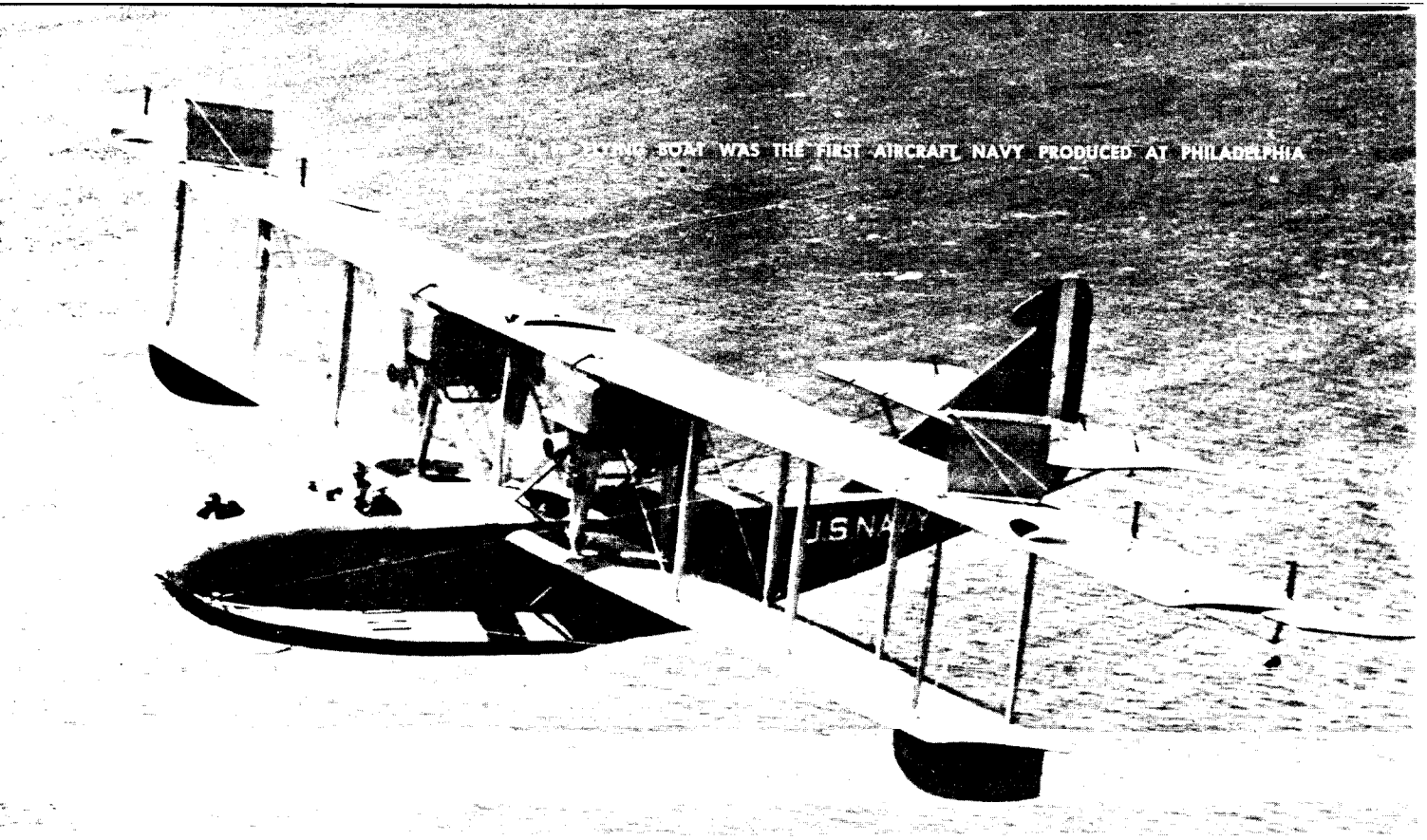
In June 1917, therefore, the Navy Department directed Commander F. G. Coburn, USN, Construction Corps, to make a survey of the situation and report upon a suitable location for, size of, and cost of a naval aircraft factory which would be capable of producing 1,000 training seaplanes a year or their equivalent. Commander Coburn visited various private plants in the country and made a detailed study of the Curtiss Company plant in Buffalo, at that time the only factory in the country that could be considered a quantity-producing plant for airplanes.

Upon completing the tour, Commander Coburn, with Naval Constructor L. M. Henry, wrote a report entitled, "Proposed Naval Aircraft Factory." This report, meeting with the approval of the head of the Bureau of Construction and Repair, David W. Taylor (for whom the model Basin at Carderock, Md., was named), was forwarded July 10 to SecNav, bearing Chief Constructor Taylor's endorsement—and recommendation.

On July 27, Secretary of the Navy Josephus Daniels, acting upon the recommendation, approved the project, estimating the cost at $1,000,000. The Philadelphia Navy Yard was selected for the new venture since ample land was available there and the location was advantageous in terms of labor, material and transportation. Furthermore, the Delaware River offered a natural facility for testing seaplanes.

Construction was to include a main building for the factory proper and three auxiliary buildings—a dry kiln, dry lumber storehouse, and boiler house. Commander Coburn estimated the minimum time required to put the factory into operation at 100 days.

Believing as SecNav so succinctly (and prophetically) put it in his 1918 Annual Report that "aircraft [had] come to stay," the Navy built the new factory as a permanent structure. A temporary one would have cost very



THE H-16 FLYING BOAT WAS THE FIRST AIRCRAFT NAVY PRODUCED AT PHILADELPHIA

little less and building for the future was a better investment.

No time was lost. The contract was let on August 6, and the ground broken four days later. The first power-driven machinery was put in operation on October 16, and the entire plant was completed by November 28, 1917, 110 days after breaking ground. Commander Coburn was appointed as first manager of the factory and reported at the Philadelphia Navy Yard for this duty August 27, 1917.

The first mechanic was employed on October 1. Employment posed a difficult problem, particularly at the beginning, for most of the employees, including superintendents, engineers, inspectors and foremen, had to be trained to execute their particular tasks. Of 400 engineers and technical men, not more than ten had had previous airplane experience. By executive order of August 23, 1917, special classes of employees were exempt from competitive examination, but others were obtained in accordance with Civil Service regulations.

THE NAF log indicates that the first women employees went to work in December in the Inspection Department, inspecting turnbuckles. Special efforts were made to use and train women employees, and on April 10, 1918, the women's apprenticeship school opened at the factory. By the end of the war, women made up practically 25 percent of the entire force. They were employed on the principle of equal pay with men for equal work.

A training school was also conducted for enlisted men who were sent abroad for assembly and repair of planes. On January 26, 1918, an ensign arrived from Pensacola to make arrangements for the first group of 50 men from Pensacola to get this training. They arrived on the 28th.

The original proposal for the factory had envisioned the building of training planes only, but this plan was quickly revised since enough trainers were being built by other factories and what was needed were types of aircraft suitable for antisubmarine patrol and convoy duty. The Factory therefore began work on the production of Curtiss H-16 twin-engine flying boats. On October 12 the form for the first boat was laid and the work of ordering material and putting the H-16 into production began. On October 17 actual work on the first boat was started and, on November 2, the first keel was laid.

The upper wing span of the big flying boat measured 96 feet and its hull was 46 feet long. It was powered by two Liberty engines, armed with four machine guns, and carried a crew of four or five—a pilot, one or two observers, a mechanician and a wireless operator.

Plans for the H-16 had to be completely redrawn to fit the production methods employed by the Factory. While the Curtiss Company's experienced foremen and skilled workmen did not need absolutely clear, detailed drawings of every minor part, the inexperienced NAF employees required complete information. This careful and thorough redrawing of the plans, which required the better part of two months, was the work of the Factory's first Chief Engineer, George R. Wadsworth, a major in the Signal Corps, USA, serving in this capacity while on active duty.

On March 27, 1918, just 228 days after ground was broken and only 151 days after receipt of the original plans, the first NAF-built H-16 made its initial flight. A few days later, this aircraft and another H-16 were shipped to Killingholme, England, for war service overseas. These were the first of 50 authorized under the Factory's original contract, the last of which was completed on July 7.

In citing this accomplishment, Sec-

NAVAL AIRCRAFT FACTORY

retary of the Navy Daniels wrote, "Too much praise can not be given to Commander F. G. Coburn, the capable naval constructor and executive under whose direction this plant was constructed and is operated."

By December 1917, expansion of the planned operating program required an upward revision of scheduled aircraft procurement. The new schedule called for delivery of a total of 864 twin-engine flying boats of the H-16 or similar type by January 1, 1919. The total requirement exceeded not only the number on order but also the capacity of existing manufacturing plants. An enormous expansion of the Naval Aircraft Factory was therefore authorized.

It was estimated that $3,250,000 would be required to build the new facilities. Subsequently, an additional $500,000 was needed to cover the cost of a hangar and certain waterfront improvements. In addition to the hangar, there was to be a six-story concrete storehouse and a three-story office building; the assembly building was to be enlarged. When, in June 1918, the original plant was in full production, the new one was very nearly completed. The total space available upon completion was 888,935 square feet, of which 500,000 square feet were used in the manufacture and assembly of aircraft. The rest was devoted to office space and storage.

The assembly building consisted of two parts: a low building 13 feet under the roof trusses for panel shop, varnish and dope room, and pontoon manufacture, and a bay—100 feet wide, 51 feet under the trusses and 680 feet long for final assembly—which was flanked on either side by a bay of equal size, 50 feet wide and 30 feet under the trusses. The 100-foot bay was equipped with two ten-ton, three-motor, overhead traveling, electric cranes. Each of the side bays was equipped with a two-and-a-half ton small crane.

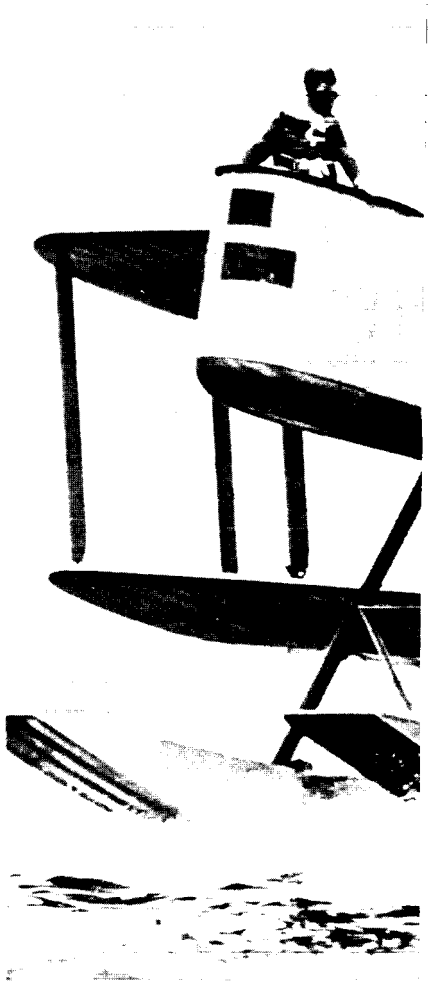
By the end of World War I, over 40 acres were occupied by the enlarged plant. A considerable increase in paving, railroad tracks, roadways, etc., was provided for in the allotment, which, including the hangar, represented a total investment of a little over $4,000,000.

Almost before this construction program began, the NAF on February 28, 1918, received an order to produce 100 H-16's in addition to the 50 it was already building. Because there was hardly time to wait for the completion of the new buildings, an ingenious plan of sub-contracting was devised. By it, the facilities of many small manufacturers were put under contract to produce wing panels, boat hulls and other more minor parts which were delivered to the Factory for assembly. By the summer of 1918, when production was at its height, the assembly plant was drawing parts from the Victor Talking Machine Company, seven yacht builders, two small aircraft factories, a number of furniture factories and automobile and sheet metal products factories. Except for the two small aircraft shops, all these plants had been drawn into the work by the Naval Aircraft Factory organization which maintained branch offices in each of its contributory plants. In addition to the nearly 3,700 persons directly engaged at the Naval Aircraft Factory, there were some 7,000 others employed in the manufacture of parts.

BY MID-SUMMER, 1918, the factory was building the F-5-L flying boat which was based on an experimental British type. It had greater endurance and was capable of carrying a heavier bomb load. Also, it was larger: its 103-foot, 9-inch wingspan was attached to a 49-foot, 4-inch hull. The F-5-L had a gross loaded weight of 13,000 pounds and a maximum speed of 89 miles per hour. Its two Liberty motors developed 360 hp each.

The British Admiralty, at the request of Admiral W. S. Sims, USN, Commander of U.S. Naval Forces in Europe, furnished the Navy Department with the drawings of the F-5. On March 15, 1918, Mr. Ward, a Royal Navy Flying Corps warrant officer, arrived from Felixstowe with the plans for the F-5 boat, of which one experimental model had been built in England. But these drawings were entirely impossible for quantity manufacture. They required hand cutting and fitting by experienced workers using materials not available in quantity.

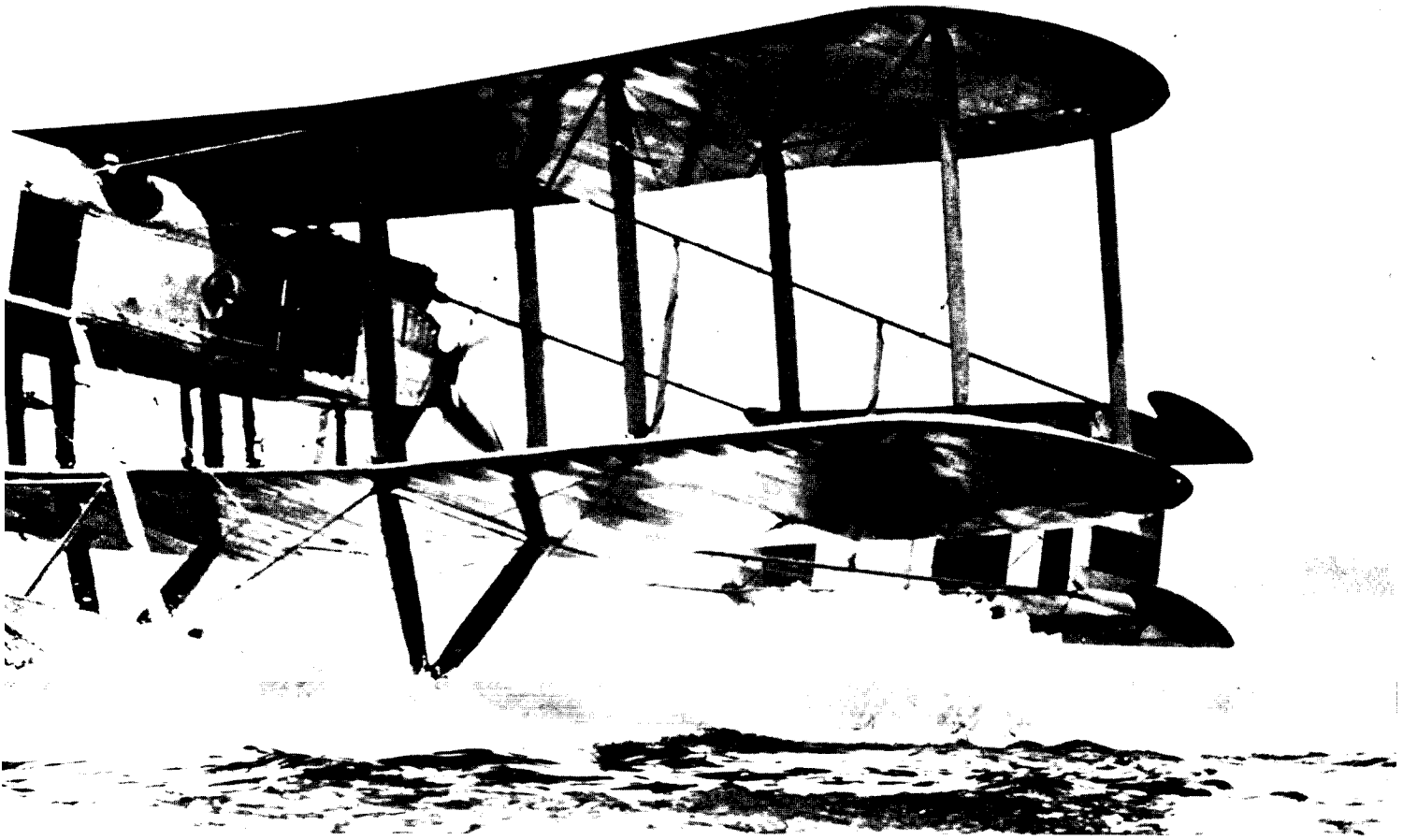
The labor of converting H-16 plans to standard plans was slight compared with the labor involved in the complete redesign of the F-5, preserving external dimensions, of course. All



metal parts had to be redesigned for machine fabrication by our methods. Since the hull in particular was considered weak by Commanders H. C. Richardson and J. C. Hunsaker, Commander Richardson completely redesigned it on a longitudinal framing system, preserving the outer lines only. The engine installation, designed for Rolls-Royce engines in the British boat, had to be redesigned to take Liberty motors. Thus the American F-5-L, resembling its British prototype only in essentials, was created.

The *Philadelphia Ledger* of October 5, 1918, described the F-5-L, a model of which was on display at the City Hall Plaza, in terms of its lethal capacity as follows: "Directly under each of the two lower wings are two death-dealing depth bombs. These are controlled by a pilot, who, on discovery of a U-boat, can discharge any one of the bombs. Adorning the port cockpit in a ring mount is a Lewis machine gun. Another is at the rear of the plane,

N-1 SEAPLANE ON AN EARLY TRIAL AT NAF



while two others are at either side."

In June 1918, production had reached the point of one aircraft a day. On July 7, the last of the original order of 50 H-16 flying boats was completed. The average cost of the last 20, including overhead, was less than half the average of the cost of the first ten.

The total output of the Naval Aircraft Factory to December 31, 1918, included 183 twin-engine patrol flying boats, with 50 sets of spare parts. Of the 183, the last 33 were F-5-L's.

To appreciate fully the magnitude of the job accomplished, one must remember that the Navy was only six years away from its purchase of its first aircraft, the A-1, and all the main advances in manufacture in quantity were still in the future. To start from scratch as the Naval Aircraft Factory did and be required at the same time to turn an inexperienced group of people into a force of skilled workers might well have turned into a shambles of an obstacle race gone wrong. But it did not, and the record shows that the Navy planners and designers did a magnificent job in record time.

In addition to the production figures cited, the factory also began an aircraft repair program in December 1917 and built its first experimental plane in 1918, the Navy-designed N-1 Davis Gun Carrier. Two of these were built during the war. From the receipt of the plans and specifications on January 24, 1918, it required all of four months to complete the first on May 22. When this plane met with an unfortunate accident before taking to the air, a second was ready for flight on July 25 and two days later made its first (of many) in-flight test of the Davis gun.

And then the Armistice! The NAF log for that day bears quoting: "Monday—clear: (a) Employees paraded around factory in celebration of Germany's defeat. (b) Manager Coburn spoke to all hands in front of New Offce Building. (c) Factory closed down at 11:30 A.M."

Not a day was lost in cutting back, for an entry for November 12 includes this item: "Contracts for all sub-contractors were cancelled, all boats prior to 6th operation will not be completed." By the summer of 1919, the Naval Aircraft Factory had reduced its force to approximately 1,400 men.

BUT AIRCRAFT had come to stay and the factory went on. Over the years, reorganization drew off its functions and redesignation gave it new titles, but neither could take away the record of its accomplishment as a Naval Aircraft Factory. No longer having an entity of its own but existing as a number of subordinate commands of the Naval Air Engineering Center, the record it set as a factory in producing twin-engine flying boats during WW I will stand as one of the great accomplishments of the war and a challenge to all its progeny.