Fledgling Whirlybirds

HANGAR flying is as old as aviation. Nobody knows when the first pilot, unable to talk with his hands in his pockets, used his hands to demonstrate an aerial maneuver, or a combat engagement over the front.

Since 1917 many a pilot has described his gunnery by having one hand make a run on the other.

It took more than 40 years from the first flight of the Wright Brothers for a new kind of pilot to change that typical gesture. Today, the helicopter pilot, with his place in aviation secure, demonstrates in a manner similar to that used by instructor Lt. J. B. Russell (above) in discussing a flight with his student at NAAS ELLYSON Field, Pensacola, Lt. (jg) R. C. Brower. They are standing in front of the schedule board.

For a year now Navy and Marine training of pilots in the whirlybirds has been growing steadily. Some Marine pilots still are being trained at Marine Corps Schools, Quantico. Navy and Marine enlisted mechanics are being trained at the NAVAL AIR TECHNICAL TRAINING CENTER, MEMPHIS, with additional Marines at Quantico. Naval aviation's fastest growing baby needs and is receiving well-trained personnel.

THIS *is pilot's eye view of an approach to figure eight for precision flight practice*

BY FOLLOWING *figure eight and square pattern closely student learns to correct for wind*

LIKE no other type of flying, the helicopter requires full time attention of both hands and arms. Sitting side-by-side, the instructor and student discuss each maneuver. It is tough enough for a United States citizen to talk with his hands occupied otherwise. The most tongue-tied individuals, however, are certain pilots from South American countries who take the course at NAAS ELLYSON FIELD. They're apt to forget and start talking with their hands, and helicopters just don't fly hands off.

Ulcer Gulch for flight instructors has long been the rear seat of an SNJ *Texan* trainer. Whirlybird teachers have all the emotional and nervous strains of the ordinary instructor. Added to these are the limited operating area (within the boundaries of the field) and the low frequency vibration of all helicopters. Result is illustrated in the cartoon on page five drawn by Lt. (jg) Mark Starr.

A new and radically different species of bird, the helicopter has provided its share of maintenance headaches. All units operating these aircraft have had their share of trouble. To help alleviate this condition, the Helicopter Maintenance Course (Class C) was established at Memphis. This will be described later.

Because of the restricted and concentrated area required for helicopter training it was found necessary to segregate the 'copters from other training in conventional aircraft. Thus, when pilot training was shifted from NAS LAKEHURST to the Pensacola area, the training unit, commanded by Cdr. Ben Moore, was located at NAAS ELLYSON FIELD where there is plenty of mat area available for practice.

Up to the present time, pilot output has been limited by severe maintenance troubles and lagging production of new types of aircraft. Rapidly increasing production of trainers—the Bell HTL-5 and the Hiller HTE-2—and operational types —the Piasecki HUP-2 for the fleet and Sikorsky HRS-1,2 for the Marines—will increase demand for pilots and mechanics. By spring of 1952, the mat at Ellyson Field, with swarms of helicopters coving it, will look like the landing platform of a martin birdhouse.

Perhaps the most unusual feature of the course offered by Helicopter Training Unit One is that in over one year of operation no student has "busted out" because of lack of flight proficiency.

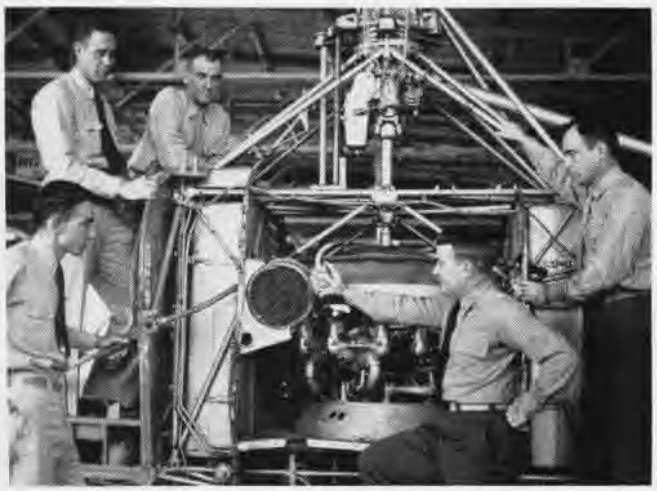
OF COURSE, all students are full-fledged naval aviators, most of whom have had operational experience for varying periods after finishing flight training. A small number of students have gone directly to HTU-1 after the completion of flight training.

A new student arriving at Ellyson is all eyes and ears. He knows that he is in for a whole new set of reactions. His first instruction is in the classroom. This all important ground phase takes him into an indoctrination period then into the theory of helicopter flight. A little history of this method of aerial locomotion is sprinkled here and there. (See NANEWS, August 1951).

It is soon discovered that the basic principles of flight are the same. A smooth flow of air over an airfoil produces the lift.

IN THIS case, however, the flow is generated by the airfoil traveling in a circular path. Thus the helicopter gains its lift independently of the motion of the aircraft. That's what sets the helicopter apart. It doesn't have to maintain a minimum forward speed. In this aircraft, the student learns, airspeed over the airfoil is related to the revolutions per minute of the rotor. Allowing the rpm to fall too low is similar to going too slow in the conventional aircraft.

Early in the course, he learns the con-



A STRIPPED *down dead bird is the practical classroom for students Ens. Jamieson, Lt. Hampton, Capt. Simpson, Lt. Hamilton, Capt. Ross*

A LITTLE *relaxation is in order after strenuous hops; enjoying ready room are students Lt. Ryan, Lt. Algermission, Capt. Culp*

trol system too. Lift can be controlled in three dimensions—vertical, horizontal and directional.

Aside from basic principles, it is soon learned that the helicopter is a complicated bird which has introduced a host of new problems. Not the least of these is stability. Most conventional aircraft will fly hands off; their design assures this. The pinwheel, however, requires constant attention.

The tip-path-plane, or the plane through which the rotors pass during rotation can best be visualized as a disk whose edges are bounded by the tips of the whirling rotor blades. When this disk is tilted, the helicopter moves in the direction of the tilt. Part of the lift is translated into horizontal movement.

Lift is varied by varying the angle of attack, or pitch, of all the rotor blades at the same time. That is collective pitch, controlled by a lever at the pilot's side. Directional movement is accomplished by changing the pitch of an individual blade while it is passing through part of a revolution. It is called cyclic pitch. This control is a stick which is like the stick in a conventional aircraft. In this manner the disk is tilted. Moving the stick in any direction will cause the helicopter to move in that direction.

"Rudder" pedals control fuselage heading, but not direction of flight. In the tail-rotor type of aircraft they change the angle of attack of the tail rotor blades, causing the tail to go one direction or the other. With coaxial, or contra-rotating rotors, varying torque in the two rotors is introduced to control direction, while with tandem rotors tilting the disks in opposite directions does the job. The throttle is a motorcycle-type grip mounted on the collective pitch lever at the side of the pilot.

Subsequent lessons go into the theory of flight thoroughly. Engineering and structures, a must for every pilot who flies any aircraft, takes 18 class periods, compared with seven for the flight theory phase.

CLASSES *at NAAS Ellyson Field are about evenly divided between Navy and Marine pilots, with an occasional Coast Guard officer; instructor is LCdr. Fink, training officer*

ONE LESSON in the ground course emphasizes that long life for pinwheel pilots is tied to proper loading even more than for conventional aircraft. Because of critical stability characteristics in single-rotor aircraft the loading must remain near the center of gravity. An off-center load has caused many a helicopter to come to grief shortly after takeoff.

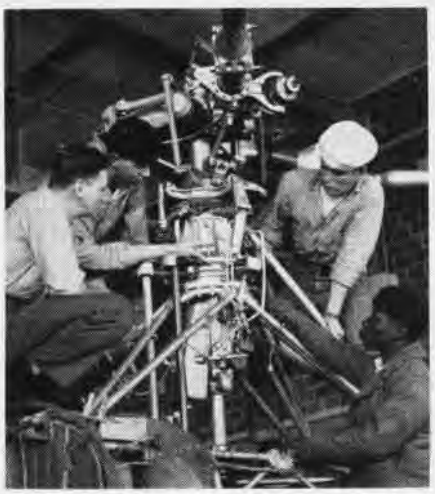
In the HO3S the allowable travel of the center of gravity is only 3.78 inches.

The would-be pilots learn to work out the loading problems with weight-adjusters similar to slide-rules. Often ballast must be carried in addition to whatever cargo or passengers are loaded. One safety check, even after care is taken in loading, is to hover one foot off the deck to check balance.

Maximum weight also enters the picture. While hovering, a helicopter takes advantage of the "ground cushion" effect, which aids lift. When shifting from hovering to forward movement the aircraft flies off the cushion. As speed increases, translational lift is obtained. Some lifting ability is lost during the shift, so maximum allowable weight depends on lift at that period.

CONSIDERATION must also be given to avoiding an overload in the event of engine failure which would make an autorotation emergency land-

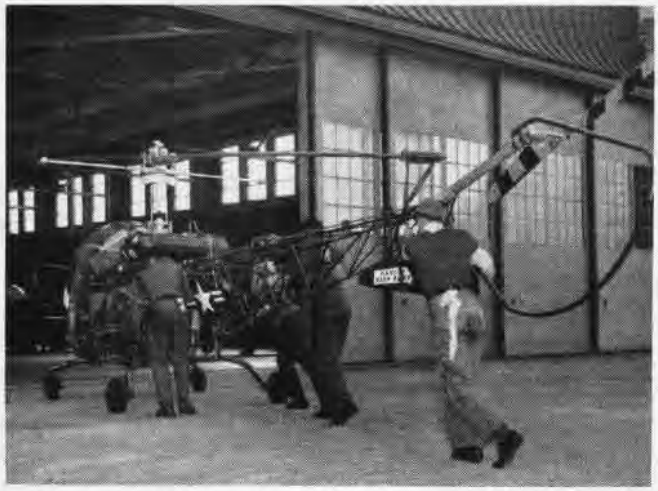
HILLER *HTE is studied by Capt. Crowell, LCdr. Morse, Lt. Ryan, Lt. Christensen, Lt. Silliman*



ELLYSON *instructor Dahl explains rotor head assembly to D. Wilson, C. Firth, T. Gayden*

AT MEMPHIS *mechanics school instructor Acord shows use of bearing puller for HO3S rotor*

ACTIVITIES *at Ellyson are run like carrier deck; typical team is line officer Coyne, Grizzell, AD1, Jones, ADC, Stepic, and Garriga*



WHEN *aircraft is "downed" after flight it is immediately pushed into hangar; Clark, Duncan, Miller, Stepic roll HTL-4 in for work*

ing necessary. Weight considerations must also allow for decreased lift at higher altitudes and under climatic conditions of less air density.

HELICOPTERS are required to operate under a variety of conditions. They fly from ships in the tropics and the Arctic regions. They must operate ashore in forward areas where the terrain is rugged. One part of the ground school course is devoted to acquainting the embryo whirlybird pilots with what they can expect in fleet squadrons.

Aboard ships of the Navy, most pilots can expect to be based aboard carriers, battleships and cruisers. To a lesser extent there are operations on board icebreakers. LCdr. Chris Fink, training officer of HTU-1 operated from the tender *Burton Island* during *Operation Highjump* in the Antarctic in 1946 and from the icebreaker *Edisto* in the Arctic 1947. The Exec., LCdr. Charles Tanner, also participated in *Operation Highjump*. Lt. (jg) Bill Matthews, an instructor, also operated in the Arctic. Fink, on the midwatch as officer-of-the-deck, would be relieved by the skipper to go aloft to find a lead through the ice. On returning the skipper would turn the deck back to him saying, "O.K., you spotted the lead up there, now find your way through it."

Shipboard operations require precision in handling on deck because of the movement of the ship, and special considerations in flying the aircraft to take care of pitch and roll. The helicopter has a high center of gravity and can easily turn over. A five-man crew can handle one, but they must be well trained. On board an aircraft carrier the standard job is to take station along the starboard side of the ship during takeoff operations and aft on the same side for landing operations.

The present day counterpart of the old catapult planes of cruisers and battleships is the helicopter. The unit is organized the same. Missions performed are mine spotting and spotting gunfire. In Korea much shore bombardment of ships is directed from helicopters.

Marine pilots, based ashore, must consider the hazards of rough terrain. Eddies of wind in the vicinity of a mountain or hill can be dangerous.

ALL SERVICES make tremendous use of helicopters for utility work. As a means of rapid communication, it has no peer ashore or afloat. Mail and personnel transfer form a large portion of the operations. The helicopter detail is busy at sea. It is busy in port.

Some other subjects covered are: hoisting of personnel rescued from the sea and land; medical care of survivors;

RESCUE *hoist installed in the Piasecki HRP-1 is demonstrated to Memphis maintenance course students by instructor Humphries*

REENACTMENT *of a rescue made last summer by a pilot of HTU-1 shows how persons in Pensacola Bay were blown by HTE to the shore*

IN BETWEEN *periods at Ellyson Field crews busily refuel and shoot minor troubles; whole line is run similar to carrier deck*

THIS *scene will be multiplied four times as training load at Ellyson picks up with deliveries of aircraft to operating units*

operations in hilly terrain where air currents are tricky; and photography.

Students attending the course at Ellyson are about equally divided between Navy and Marine pilots. One Coast Guard pilot is in each class. Aim is to have all pilot training there eventually.

Keeping the pinwheels flying is an important task. The pilots at Ellyson must know their aircraft thoroughly. Mechanics trained at NATTC MEMPHIS know them in more detail.

Mechs attending this Class C school are given a course lasting eight weeks including 320 hours of classroom instruction. Although it is devoted mostly to maintenance, there are also subjects in military training, physical training and recognition. All men who attend are rated mechanics. They must understand helicopter construction, maintain rotor systems, flight controls, power plants, transmission systems and drive shafts. They must know how to inspect aircraft before and after flights. They must drill in ground handling and observe all safety precautions.

The rotor head of a helicopter is a complicated mechanism. At first glance it is a crazy quilt of gears and arms.

THE TRANSMISSION system is also complicated because the engine is remotely located from the rotor head. These long transmission lines plus the reduction gear boxes create maintenance and design headaches. Cooling of the engine is a special problem too because there is no forward speed much of the time to furnish natural air flow for cooling. There is a clutch assembly too.

Rotors come in for a lot of study. Most of them are not rigid; can flap up and down and move forward and backward on their hinges. All rotors with three or more blades must be non-rigid. Two rotored types can be semi-rigid.

Mechanics are given the history and background of the rotary wing aircraft the same as the pilots. Each part of the aircraft comes in for special study. Specific models are gone over in detail.

FLAG, *Navy Exchange building and water tanks frame Bell HTL-4 trainer at NAAS Ellyson*

PORTRAIT *of helicopter instructor at Ellyson Field after three student flights in a row*

Since these men will be crew leaders their comprehension must be complete. Trouble shooting of every part of the aircraft is thoroughly understood. They will also have many flights in helicopters. That's an added incentive to learn the job well.

The actual flight training at Ellyson is divided into primary, intermediate and advanced phases. The first phase in HTL's and HTE's includes ground handling and taxiing, holding constant altitude, maintaining constant rpm, attitude control, hovering, transition to forward flight, climbing, gliding, sideward and rearward flight, vertical takeoffs, and above all autorotation.

Autorotation is to the helicopter pilot what emergency landings are to the conventional aircraft pilot. With an engine failure, a safe landing can be made by making use of the ability of the rotor blades to continue turning after the engine fails

Some flights are made with aircraft fitted with wheels, others with skids. Marine Capt. T. R. Cowdry, out for his first solo in the "B" stage and carrying his first passenger experienced complete engine failure in a 'copter fitted with skids. From 500 feet he made the first forward speed landing on skids.

One maneuver to teach precision, pictured here, is flying over a figure eight, and a square pattern. This teaches the pilots to take into account varying winds.

LATER, in the advanced stage in service-type helicopters, hoisting is practiced—a job many will have to do in operational squadrons when rescuing personnel. Other items practiced are backward takeoffs, running takeoffs and landings, cross country flying, ditching procedures and high wind procedures.