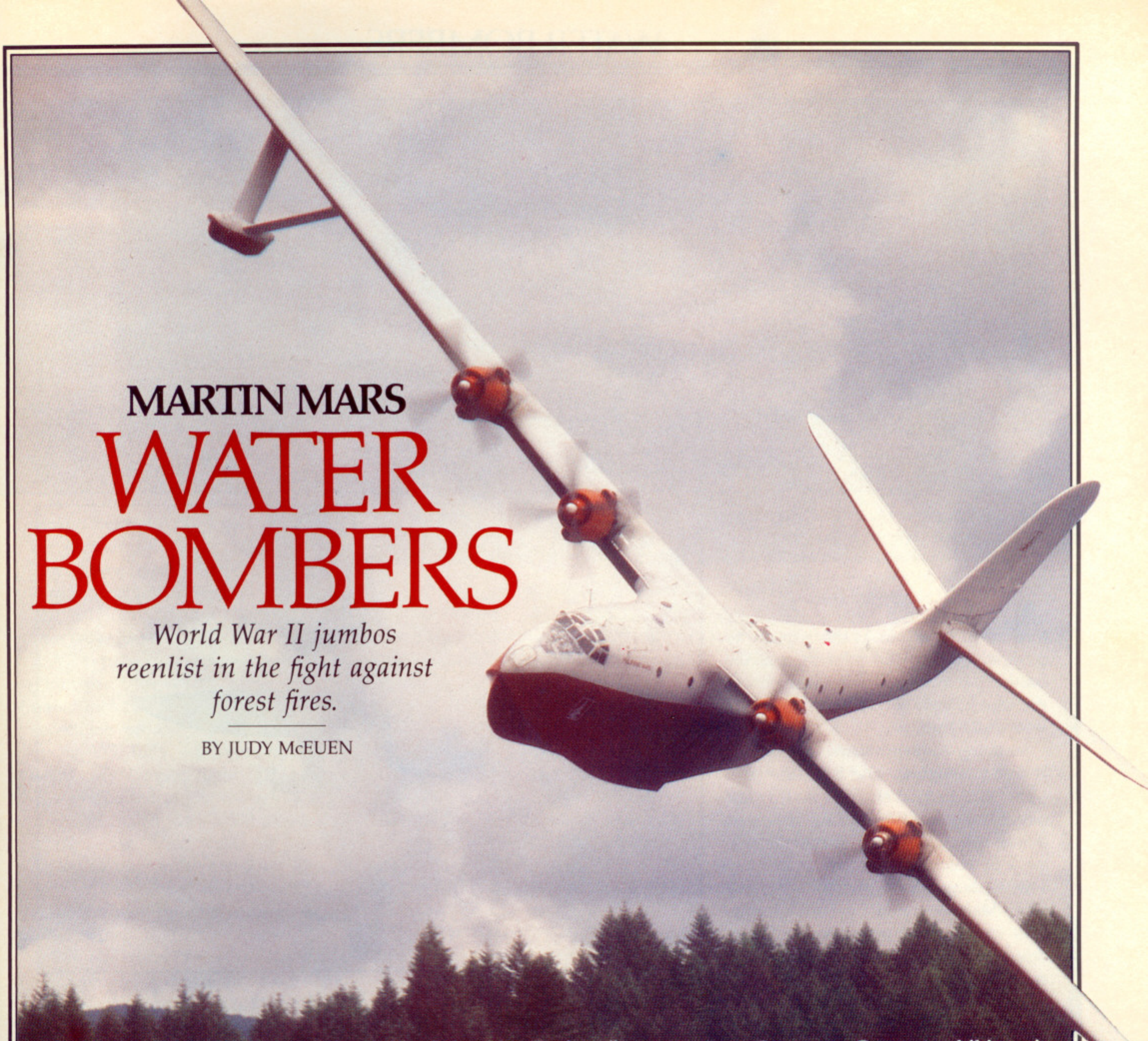


MARTIN MARS WATER BOMBERS

World War II jumbos reenlist in the fight against forest fires.

BY JUDY McEUEN

The immense Martin Mars flying boat—its hull 120 feet long, its wingspan greater than a Boeing 747's—is an impressive sight resting on its mooring. But to see the Mars in flight 100 feet above the ground, dousing flames with tons of water, is to observe an awesome spectacle.

Today, only two of the six Mars flying boats (built by the Glenn L. Martin Company in the 1940s) remain. They are owned and operated by a consortium of Canadian lumber companies in British Columbia. Together, these companies have formed Forest Industries Flying Tankers, which operates the flying boats.

Most of the time, the two Mars water bombers float peacefully in front of Forest Industries headquarters on Sproat Lake, near Port Alberni, British Columbia. During fire season, they are kept ready—each requires a one-hour preflight check, which is done every morning. Even so, it takes 15 to 30 minutes to ready the Mars for takeoff.

The airplanes taxi far down the lake while each aircraft's four Wright Cyclone 3350 engines warm up. The outboard engines are used for steering during the taxi, and the inboards can be reversed for braking.

Takeoff speed is 82 knots. As soon as the Mars is in the air, the captain gives control of the throttles to the engineer. The engineer controls the power at all times other than during takeoff, water drops and landing. Cruising speed is 160 knots, empty, and 130 knots, full.

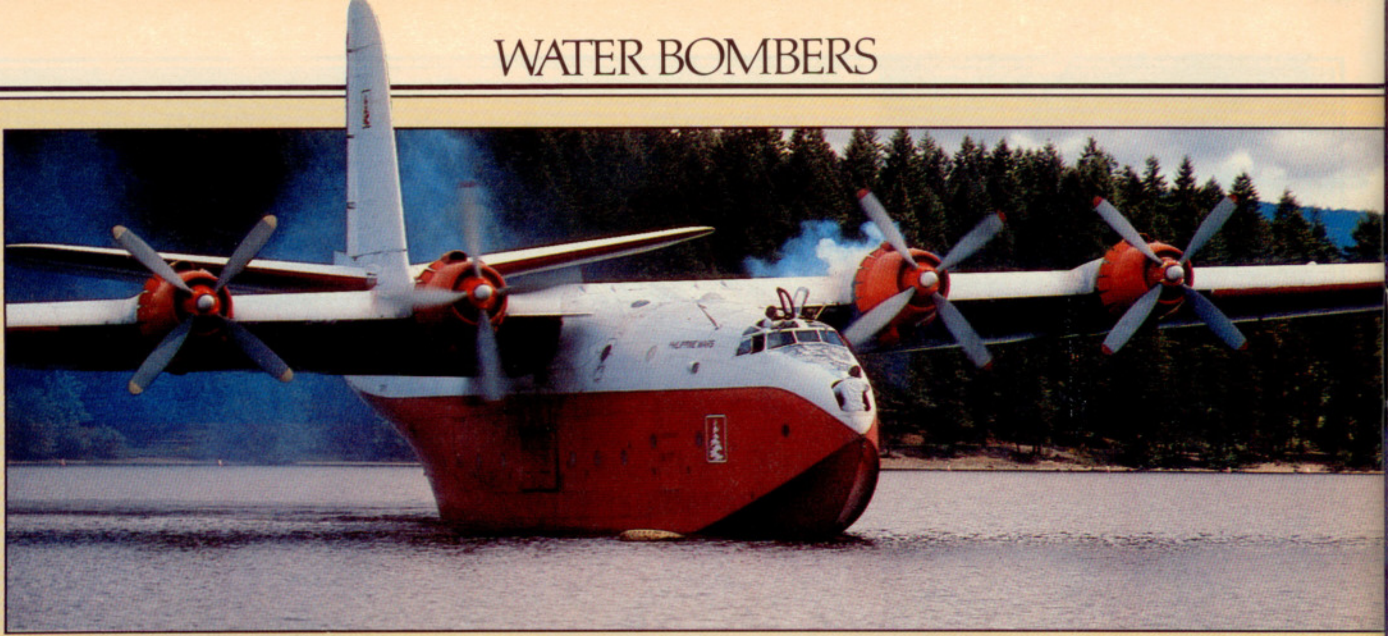
As soon as the fire call is received, a Grumman Goose amphibian aircraft is dispatched to survey the scene of the fire and establish communications with any ground firefighting crews.

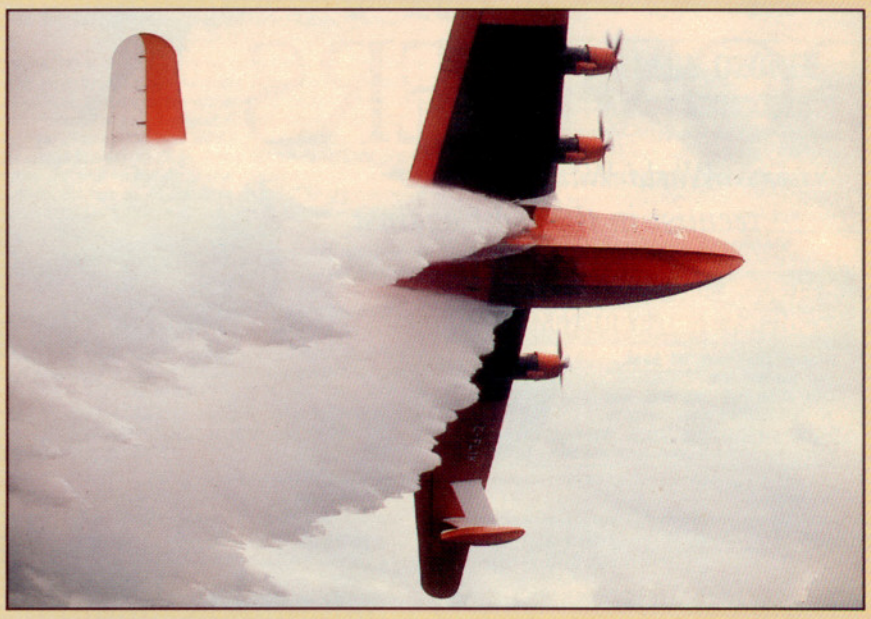
The Goose is always flown by a Mars-qualified pilot—it is important for this spotter to know the capabilities of the large, heavy airplane.

As the Martin Mars arrives, the pilot of the Goose is able to give a situation report and lead the Mars to the first drop site. The Mars pilots try to get down to an altitude of 100 feet over the fire for a drop—they are never more than 250 feet above the drop site. If the area is open, they might drop down to 50 feet for better water impact.

The release of 6,000 imperial gallons (approximately 7,200 U.S. gal-

PHOTOGRAPHY BY MARK McEUEN





This 1945 photograph (above) shows a Navy Mars taxiing home to the Patuxent NAS. Push a button and 7,200 gallons hit the fire (right); 50 feet agl gives best water impact.

lons or 30 tons) causes the airplane to pitch up. So, as the pilot presses the button for the release, he also pushes the control yoke forward to maintain a level flight path.

To bomb a steep hillside, the aircraft is flown straight at the hill—the pilot turns the aircraft sharply at the last possible moment, releasing the load during the turn, which causes the water to fly onto the hill.

(It is dangerous work. In 1961, another Mars operated by Forest Industries struck some trees after a water drop and crashed, killing all four of the crewmembers aboard.)

After the first drop, the Goose leads each tanker to the closest suitable body of water to refill its tanks. The Goose then continues to circle in the area in case it is needed.

For reloading, the pilot makes a normal touchdown, but the engineer maintains enough power to keep the airplane on the step, skimming over the water at 60 to 70 knots. Two probes are extended beneath the surface of the water. It takes just 30 seconds for the Mars to take on its capacity of 6,000 imperial gallons. The copilot times the scoop and retracts the probes at the end of the 30-second period. The engineer then brings the throttles up to takeoff power, and the Mars is in the air again.

The probes used during the water scoop are designed to break if they hit debris or if the airplane "skips." A scoop *can* be made with only one probe, but two replacement probes are carried on board. They can be installed without returning to base.

A mechanic is on board during every fire fighting flight. He replaces probes and tends to all other equipment problems. For instance, the hydraulic system for the flaps once failed. In order to fight the fire, the mechanic (with a headset) was sent to the lower deck to work the flaps manually.

Depending on the proximity of the water supply to the fire, the time between drops is between eight and 30 minutes—generally around 15 minutes. Chief Pilot Jack Waddington said that he was able to make 33 drops during one sortie, when the water source was very close to the fire.

The airplanes sometimes fly from dawn to dusk fighting fires. Each Mars carries enough fuel to stay in the air for four to five hours. They must return to their home base to refuel; fuel lines have been run under water and up to the aircraft's moorings. If maintenance is necessary during a fire, the mechanics work all night so the tankers can be back fighting the fire at dawn.

It takes a staff of 30 to run the fire-fighting operation, including four pilots. Twelve extra engines are maintained in airworthy condition, in case replacements are needed during a forest fire. During a fire, when speed is of the essence, mechanics can replace an engine in approximately 23 hours.

Forty years would be considered a lifetime for most aircraft. But the two surviving Martin Mars flying boats will be kept hard at work because these aircraft are such efficient fire fighters. □

Judy McEuen is a dental hygienist. Her husband, Mark, is a photographer and pilot with 200 hours of flight time.

MARTIN MARS: A CAPTAIN REMEMBERS

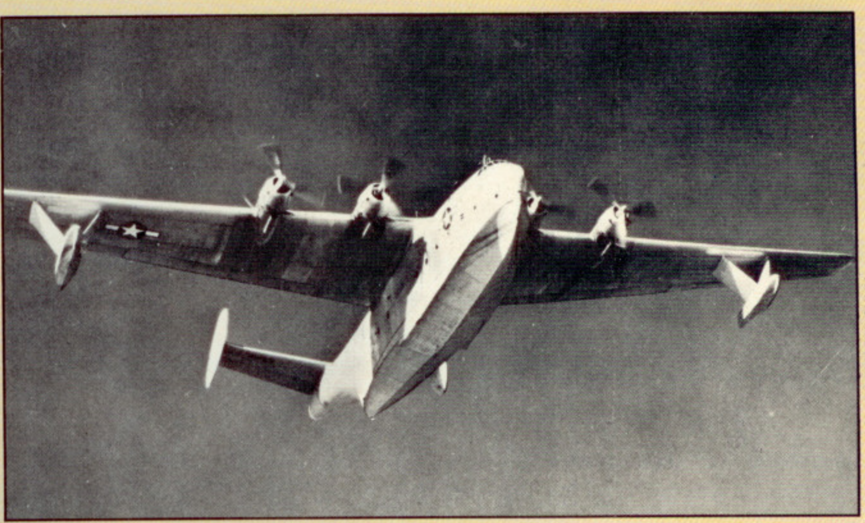
I flew the Martin Mars during the Korean War while on active duty with Naval Air Transport Squadron Two. I flew on the Pacific Ocean routes—usually San Francisco to Honolulu and back, with an occasional trip to Japan or along the west coast, transporting high priority military cargo and passengers. Most Pacific routes were flown at night (of my 3,200 hours, 2,800 were logged at night) simply because it was more difficult to navigate in the daylight; the primary method of navigation was celestial.

When flying in clouds, Loran became almost the only means of fixing our position with any degree of accuracy. There was, however, an ocean station vessel located about 900 miles east of Honolulu that provided radar fixes on request.

A typical transpacific flight ("transpac," for short), 2,100 nm over water took 12 to 14 hours, nonstop, depending on the winds—often with up to 135 fully equipped troops on board. My longest flight (17.2 hours) was westbound to Honolulu—the only cargo on board was 1,000 pounds of whole blood. That night, we had the Pacific to ourselves—no other aircraft in use at the time had the range to make the trip into the teeth of 80- to 100-knot winds at cruising altitude.

Transpac crew briefings were held two hours prior to scheduled departure time (8:00 p.m. local time for San Francisco and 4:00 p.m. from Honolulu). After the briefing, the crew went to the aircraft, where the engineers checked for airworthiness, proper fuel load and cargo security. Meanwhile, navigators checked publications and equipment and laid out their charts; orderlies checked and loaded supplies; the radiomen checked their equipment; and the aircraft commander personally checked the loading data to ensure that weight and balance calculations were within limits. During the crew briefing and aircraft preflight, passengers were also assembled for a briefing on ditching procedures and the use of survival equipment carried aboard the Mars.

Beginning one-half hour before scheduled takeoff, flight and beach crews took their stations aboard and around the aircraft, and the passengers embarked. The Mars engines were started and the airplane was towed clear of the "U" dock upon a signal from the aircraft commander. Once clear, the tail and bow lines were cast off, and we began to taxi to the sealane. Enroute to takeoff position, engine runup was accomplished either by adding power to 30 inches of manifold pressure simultaneously, first on the inboard engines and then on the outboards, or by checking one engine at a time while circling on the water. During taxi, the chief flight engineer checked the fuel tranfer system (the main fuel supply was carried in six 2,000-gallon capacity hull tanks and transferred to two 600-gallon service tanks located in the port and starboard wing roots). When all check lists were complete, communications established with air surveillance radar (for use in case of emergency on departure), ATC and tower clearances obtained and crewmembers were at ditching stations, takeoff commenced.



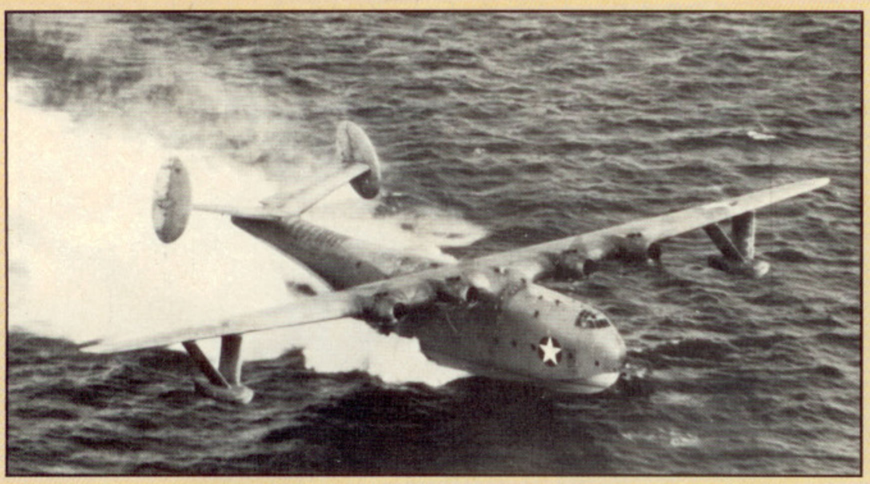
NATIONAL AIR AND SPACE MUSEUM

JATO (jet-assisted takeoff) was necessary when sea conditions were dead calm or very rough. Sixteen JATO bottles mounted on the fuselage aft of the main cargo doors were fired in banks of four according to a predetermined sequence. Once the pilot had the aircraft on the step and fully under control, he passed control of the throttles to the engineer at the panels who adjusted them to assure that all engines were developing maximum allowable power. Lift-off occurred at 85 knots. Takeoff time and distance varied widely with load, wind and sea conditions. After takeoff, power was reduced to METO (maximum except takeoff) for the climb. Rate of climb when fully loaded was about 500 fpm.

Once clear of the last airway fix, the aircraft commander took up the heading posted in the cockpit by the navigator, checking compass variation, deviation and forecast wind to make sure it made sense (17 degrees of variation applied incorrectly can get you lost in a hurry over water). After reaching cruising altitude, and when the chief engineer had set cruise power, the aircraft commander would split up the crew, keeping the experience level on the flight deck approximately equal, and set the watch (four hours on, four hours off).

The navigators took and plotted celestial and/or Loran fixes at least hourly to check actual flight progress against forecast; engineers plotted actual fuel consumption against forecast and reduced cruise power at two-hour intervals as fuel weight burned off. These were plotted on the trip "Howgozit," which was used to make the continue/return decision in case the winds enroute were significantly less favorable than forecast. Fuel carried in the hull tanks was consumed in a manner that ensured the center of gravity was kept at optimum. Position reports were sent hourly by carrier wave (i.e., Morse code).

After level-off, the engineers proceeded into the wings to remove the fire walls aft of the engine nacelles to check for oil leaks (occasionally, engines were feathered in flight to perform minor maintenance). Access to



The Martin Mars on the step. Flight trials of the prototype began in 1941.

the nacelles was via a catwalk through a tunnel inside the leading edge of each wing. The engineers repeated this check just prior to the equi-time point (that point along the route where the time to return to the point of departure and the time to continue to the destination are equal) and, again, one hour before reaching destination. Routinely, the Mars would arrive at its destination 12 to 14 hours after departure. All transpac flights were flown on instrument flight plans, and a full instrument approach was executed on arrival for crew training purposes. (Most pilot training was accomplished on line flights because aircraft were seldom available for local training, and the cost per hour was prohibitive.)

For dispatch purposes, our weather minimums at destination, with air surveillance radar available, was a 200-foot ceiling and one-quarter mile visibility. Crew technique during final approach in marginal weather was "head up, head down"; that is, the copilot flew while the aircraft commander monitored the approach and made visual contact with the seaplane environment (crash boat, lighted buoys). When the aircraft commander made visual contact, he took over the controls and landed the aircraft. The first visual contact was often orange smoke from a daylight survival flare released by crash boat personnel.

Despite its size and weight, the Martin Mars flying boat, once airborne, flies like a big four-engine Cub. But, like any large airplane, it is not highly maneuverable. It is, however, very stable when flown on instruments. Flight instruments are basic: magnetic compass; airspeed, attitude, heading and turn and slip indicators; pressure and radar altimeters; airspeed and VSI. Flight and engine controls are conventional; only the elevator controls are boosted hydraulically. Due to its great wingspan, the Mars has a pronounced tendency to overbank, but pilots seem to adjust quickly to this.

Docile as it is in the air, the Mars presents a real challenge on the water. Precise taxiing, takeoffs, landings and dockings/moorings require sharp seamanship ability and strong water-handling skills, especially in high winds and/or rough seas. These aircraft are not equipped with water rudders or sea anchors; however, the two inboard propellers are reversible to facilitate maneuvering on the water in close quarters. Three-engine (and even two-engine) performance is good. In fact, the Caroline Mars once limped into San Francisco Bay with two engines feathered and one of the two remaining engines operating at reduced power. Fortunately, it carried no load at the time.

With approximately 12,000 hp available at takeoff (and no nose-wheel steering available), the Mars has a pronounced tendency to turn left, especially in the early part of the run. This tendency becomes critical in a heavy left crosswind. To counteract this, pilot technique calls for advancing numbers 1, 2 and 3 throttles ahead of number 4. This keeps the aircraft headed straight until the rudder becomes effective at 30 to 50 knots. When power is applied, the bow rises and, at about 40 knots, lowers again as the aircraft comes onto the step. An attempt to force the aircraft onto the step prematurely with forward elevator pressure can result in the fearsome "porpoise." Once well developed, the porpoise (bow alternately pitching up and down) can be stopped only by closing the throttles.

Water landings are simple unless on very rough water, at night or on perfectly calm water when it is impossible to judge height above the surface accurately. Night and calm-water landings are made by setting power and attitude to give a 200-fpm rate of descent at 80 knots. This power and attitude is held until the keel touches the water, and then the throttles are closed (I once was forced to land in San Francisco Bay in zero/zero conditions using that technique, with 74 souls on board). Rough water landings are made as nearly into-the-wind as possible, using full flaps and flying close to full stall. Due to the length of the fuselage, the pilot is often 50 to 60 feet in the air when the keel first touches the water.

Once on the water, handling the Mars is akin to handling a small seaplane—it tends to weathercock into the wind. The high, flat sides of the fuselage make it difficult to turn out of the wind when velocity is high, and taxiing directly downwind is a real art.

The Mars can be anchored or secured to a special buoy, where passengers and cargo can be off-loaded by boat. However, the usual procedure is to bring the aircraft alongside a floating pier or into a "U" dock by a system of lines and buoys called a bridle. The approach to the dock is critical. If the buoy is missed, the aircraft can ram into the dock or seawall, as there are no brakes. Again, the two inboard propellers are reversible, but it takes a great deal of experience to become a skilled Mars aircraft commander.

When I flew the Mars, most pilots ordered to the squadron had logged thousands of hours in PBY Catalina or PBM Mariner flying boats. Once on board, all were required to qualify as transport navigators and acquire 500 hours copilot time before being designated aircraft commanders. The average qualifying time was 18 months and 1,500 total flying hours for experienced pilots; qualifying took much longer for "first tour" pilots who were fresh out of flying school. *—Richard Gless*

Richard Gless, AOPA 522715, is a former naval career aviator and is vice president, operations, for the Air Safety Foundation. He has logged more than 10,000 hours.