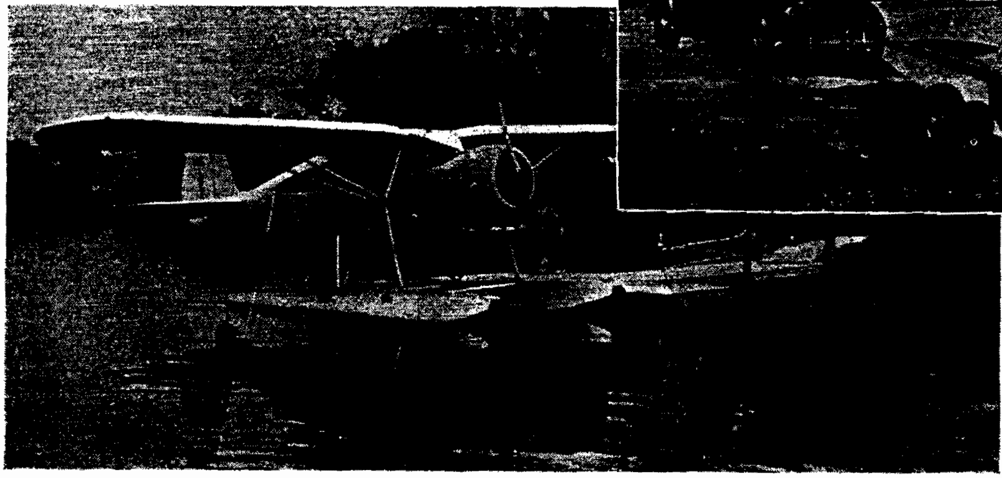
. . Seaplane docking facilities.

Lloyd Laflin's Aeronca seaplane on the balloon-tired wheel equipped platform at Fox Lake, Ill. Below: The Heaney float at Kinderhook Lake, New York



BASES fo

By DONALD D. COOKE

● Much has happened in the field of private and non-scheduled water flying during the past few years. While activities have redoubled in those comparatively few areas where some semblance of adequate seaplane facilities exist, they have also sprung up in a number of widely-separated localities where enterprising pilots have constructed facilities for housing and securing their machines.

The purpose of this article is to review the developments which have taken place and to classify them so that the experience gained can be intelligently incorporated in future seaplane base designs. As a matter of convenience, distinction is made between "landing" and "storage" bases, with a further division into private and commercial facilities.*

Landing Bases

Low Dock.—Landing bases, which can be defined as facilities for the loading or discharge of passengers as well as for temporary parking of seaplanes, are the simplest type to build. Where variations in water level average less than approximately 2 ft., an ordinary low dock can admirably serve the purpose. Such a device is inexpensive to build where the bottom shelves off gradually, and even if ice conditions make it necessary to take it up in the fall, it is quite easily put down again in the spring. The dock should preferably be built "L" shaped, the off-shore face planked up smooth from the top to a point at least 12″ below water, and then protected with automobile tires. Where there is not much wave action from either wind or passing boats, it will be found that 2-by-4s spaced vertically about 3 ft. apart and nailed to horizontal stringers carrying 1″ planks will be quite satisfactory.

Landing Float.—Wings or struts of a seaplane will not always clear a dock at low water where there is an appreciable change in water level, and under these circumstances a float is necessary. This can be moored by booms and cross chains either to a bulkhead or to piles driven for the purpose, with a gangway, or combination gangway and dock, provided for access.

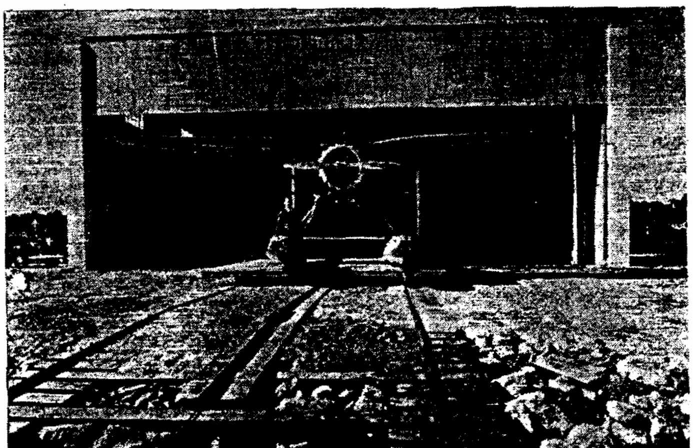
An interesting variation of the landing float has been designed and built by Mark Heaney, for Chester Braman's base on Kinderhook Lake. The off-shore face of the float has a lip or shelf built on to it below the surface of the water. The surface of this shelf is at right angles to the face of the float but slopes away from the middle toward either end. The depth of water over the ends is, therefore, greater than that over the middle.

When a seaplane comes alongside, the near pontoon goes aground on the rising slope of the shelf. This action stops the ship and holds it fast alongside the float. In getting away, the throttle is opened, the keel rides over the hump, and the plane slides down the other slope until it is clear.

Turntable Ramps.—The third type of landing base is the floating turntable ramps as used in the East River, at New York. While these ramps handle any size ship with speed and efficiency, they were designed primarily for transport types, and because of their cost would not be recommended where only small ship operations were under consideration.

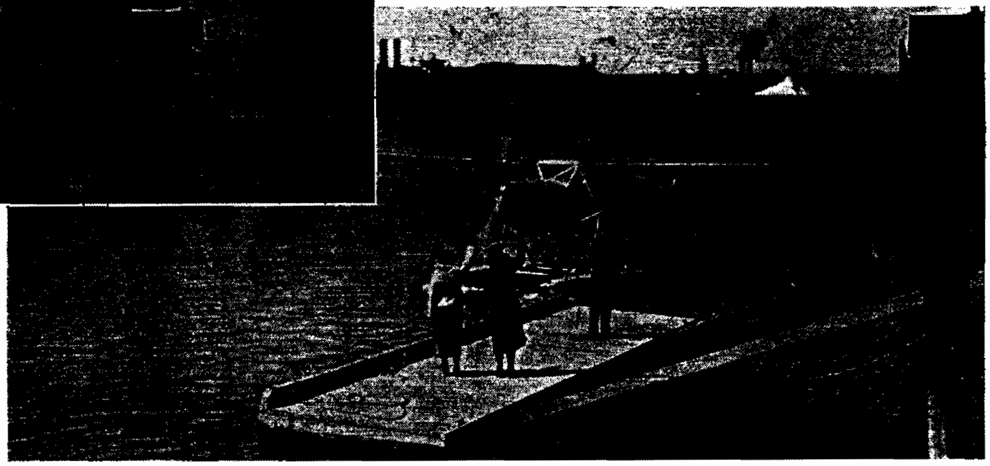
Miscellaneous Equipment.—At smaller bases, fuel can be handled by a 50-gallon wheeled tank similar to those used in automobile garages. An extra long hose with a stop valve at its end is required. The tank can be kept under cover and wheeled out on the dock or to the edge of the bulkhead when needed. Fuel can be transferred from drums to the tank by rolling the drums up onto a wooden trestle built for the purpose and allowing them

* "Marine Air Terminals," by George B. Post; AERO DIGEST, Oct., 1935, gives a more detailed description of certain types of bases.



Marine railway and brick hangar used by Robert Orrell at Daytona Beach, Fla., for his Stinson

Low dock type landing base which includes a locker for stowing supplies. Below: Simple type of landing float showing method used to dock a seaplane



SEAPLANES

Chairman, Seaplane Base Committee,
Seaplane Flying Assn., Inc.

to drain through a faucet directly into it. Where the traffic warrants, the buried tank and electric pump meets all requirements. Pipe with flexible connections can be led to the float where the hose can be stowed in a pit.

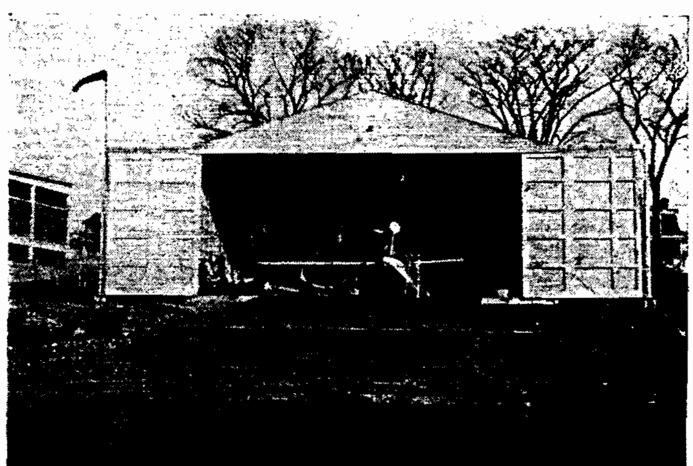
Where conditions permit, a mooring or two, and some sort of a tender should be provided to complete the landing base set up. The weight of anchor that it is advisable to use will depend on local conditions of exposure, types of bottom and other considerations, but the equivalent of a 200 lb. mushroom should be large enough in most instances for ships up to 6000 or 7000 lbs. gross weight. A rubber or cork buoy will work out most satisfactorily because a seaplane can run over it without damaging its floats. It should be fastened to the anchor by a reasonable length of chain, but if the depth of water is such that the chain sinks the buoy, a length of manila rope can be introduced between it and the end of the chain.

Handling Equipment for Storage Bases

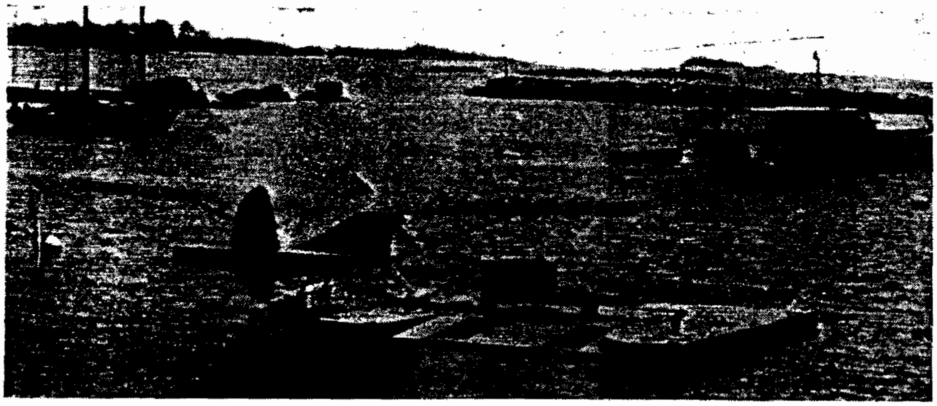
A majority of the few commercial or public seaplane storage bases which are in existence at the present time are handicapped by awkward and high-cost methods of handling the planes, and this is doubtless one of the obstacles to a rapid increase in the use of seaplanes by private owners and fixed base operators. Existing inefficient methods are not the fault, however, of the present operators, for many of these men have developed ingenious devices, and have devoted much time and thought to the handling problem. The difficulty lies in the fact that when most present-day seaplane bases were built they were not considered of particular importance, and in many cases, their construction was undertaken with little thought to providing for future needs, if such needs arose. Furthermore, there were few of the now widely used twin float seaplanes in operation at that time, and little experience was available as to their requirements.

As a result of this situation, most of these facilities consist of a rough-surfaced fixed ramp of varying degrees of slope, located from 50 to 3000 ft. from the nearest hangar and often separated from it by ground or an apron, over which nothing but a pneumatic tired wheel could safely roll. Thus, the local operator is faced with the necessity of making the best of none too good facilities, and the methods he develops are often necessarily awkward. Furthermore, since most operators are faced with dissimilar conditions, they think along different lines in their endeavors to develop better seaplane handling methods under difficult circumstances. These methods, more often than not, apply only to one particular base with its own particular conditions.

Boston Dolly.—Among the handling devices developed to meet the needs of a particular locality is the "Boston" dolly, which was designed to operate at the Boston Municipal Airport where there is a steep sloping wooden ramp located some 2000 ft. from the hangars, and where the intervening surface of the airport is part cinders, part macadam and part concrete. A "Boston" dolly costs between $200 and $300 and consists of a steel-framed, wood decked platform, about 15 ft. square, mounted on steerable automobile wheels at each corner. It is made fast to a truck or tractor by a manila rope, and then lowered down the ramp until the water line is about 3 ft. from its upper edge. The seaplane, taxiing under its own power, goes aground, on the dolly, and the truck then hauls both to the head of the ramp. From that point, the dolly and seaplane proceed to the hangar under the plane's power, with the attendant steering the dolly by the wheel or tiller, and applying brakes as may be required.



The Maher base at Greenwich, Conn., showing the steel hangar and smooth planked ramp



Franklin Farrell's floating base for his Aeronca at Pine Orchard, Conn.

The entire procedure is quickly performed and is the only practical method thus far developed to meet conditions where the ramp is far removed from the hangar, and the surface of the ground to it is not conducive to easy or safe movement. This dolly can be used on concrete, as well as wooden ramps. Its drawbacks, however, are that one unit is required for every seaplane to be stored. Also, since the ship sits on the dolly as long as it is out of the water, it takes up considerable space. Another disadvantage is that the seaplane is not easily maneuvered in the hangar.

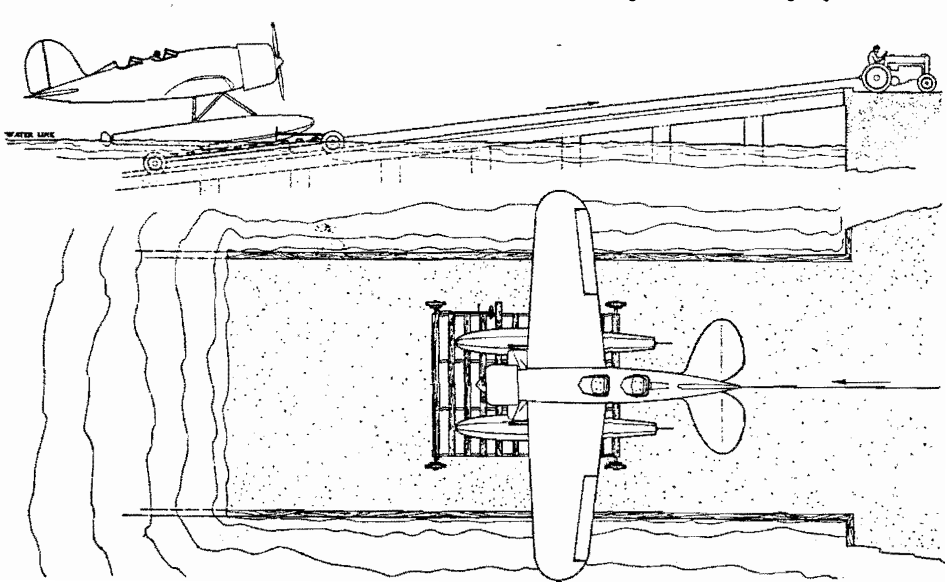
Edo Pick-Up Dolly.—Another beaching gear, developed by the Edo Aircraft Corp., and which has been used at the North Beach Airport, New York City, for several years, is a three-wheeled unit utilizing the axle holes in the floats for lifting. Two prongs, designed to fit into the inside of the axle tubes, project on either side from a point opposite the rear wheels. The height of the prongs above the ground and the tread of the rear wheels (which controls the tread of the prongs) can be varied by a screw crank arrangement. Over the steerable front wheel an adjustable support extends up under the propeller hub.

In operation, the seaplane is driven out of the water on a wooden ramp, and the dolly is centered between its floats. The prongs are then extended into the axle tubes and the propeller support lashed fast. The ship is then lifted by raising the prongs until the keels are a few inches from the ground. A towing bar is then hooked to a tractor, and the ship taken into the hangar where it is deposited on its float keels. This dolly must have comparatively small wheels with solid rubber tires and therefore a reasonably good apron upon which to operate. While its cost is approximately $600, only one is necessary at the average small seaplane base, since it is used solely in transferring ships to and from the hangar.

Christensen Dolly.—The Christensen dolly, which can be built for $200 or less, was developed to meet conditions existing at the Port Washington, L. I., seaplane base. It consists of a skeleton steel frame which is carried about an inch above the ground, on four small pneumatic-tired wheels, the front two of which are steerable. Two steel channels, lined with wood and having a V-shaped groove down the center, lie on the frame in a fore and aft position. These channels are not fastened and can be moved farther apart or closer together, as required.

The seaplane is driven high up onto the level part of the wooden ramp and two or three men tip it back on the tails of the floats. One 2″ block is placed under each keel about 2 ft. forward of the step, under the nearest bulkhead. The ship is then tipped forward, a set of blocks placed under the skeg castings, and the process repeated. After 4″ of blocking has been worked under the skeg castings by this method, and while the ship is back on the tail of the floats, the dolly is backed under, the channels are placed in a position directly under the keels, and the ship is tipped forward onto the dolly and tied down at the nose of the floats.

When the ship is taken off the dolly in the hangar, similar 4″ blocks are placed under the skegs so that it can easily be replaced on the dolly for launching. The process is workable and takes a minimum amount of time. It is particularly suited to conditions where the surface of the ramp is rough and where there is sufficient storage space to eliminate the necessity of moving ships about after they are hangared.



Diagrammatic sketch showing the method of using the "Boston" dolly in beaching and launching operations

Designing a Typical Storage Base

If the designer is free to plan a seaplane base as he chooses, an obvious question would be: "What should be specified?" Perhaps the simplest way to answer this would be to assume average requirements, and then analyze the matter step by step. An example would be a base accommodating seaplanes of various sizes ranging from an Aeronca or Cub to a Stinson, Beechcraft or Waco. With careful placing, 15 such seaplanes might be housed in a hangar 100′ × 100′ if each ship was fitted with a set of individual castering dollies so that it could be moved in any direction. Each dolly should be as small as possible so as not to take up additional space on its own account.

An apron, approximately half again as large as the hangar, should be provided as a handling area, and its surface, as well as that of the hangar floor, should either be concrete or smooth wood planking to enable the dollies to roll easily on their comparatively small casters. Similarly, there should be no obstructing door sill or track. The canopy type, or top hung door, held in place at the bottom by bolts set into the floor, would work most satisfactorily, with the door opening the full width of the hangar. In addition, any well-equipped seaplane base should be provided with a number of moorings, a boat and a set of landing floats sufficient to accommodate at least three or four planes. A fueling pit should be located at the water's edge of the apron, convenient to both the railway and the floats, and an oversized hose which will throw a good size stream of fresh water with some force is also desirable.

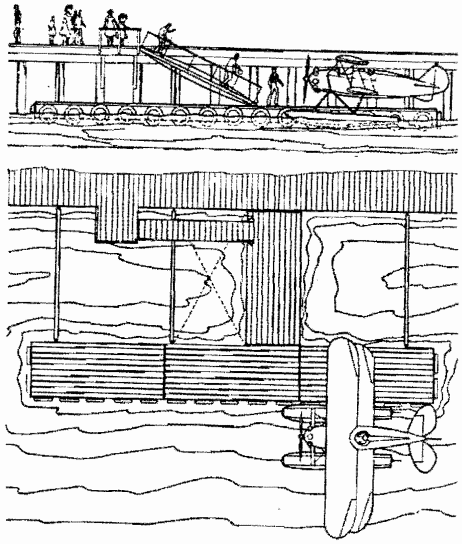
It is felt that the most efficient device for getting a seaplane into and out of the water, and one which subjects the ship to the least amount of rough handling, is the marine railway or mechanical ramp. With a platform car, 20′ × 20′ or larger, a ship can easily be taxied in and grounded on it, and in a moment or two will be safely hauled to the edge of the apron where the beaching gear is installed. A further advantage over the more commonly used fixed ramp, is its lower cost and the fact that it is probably much less vulnerable to damage from ice, for in the winter the car can be kept out of the water leaving exposed only the rails and their supports. Handling equipment should consist of four-wheeled castering dollies designed to accommodate any size ship equipped with floats having axle tubes, together with a telescoping jacking tube, and a hydraulic jack. While a pair of dollies would be needed for each ship, only one jacking tube and jack is required to do the job.

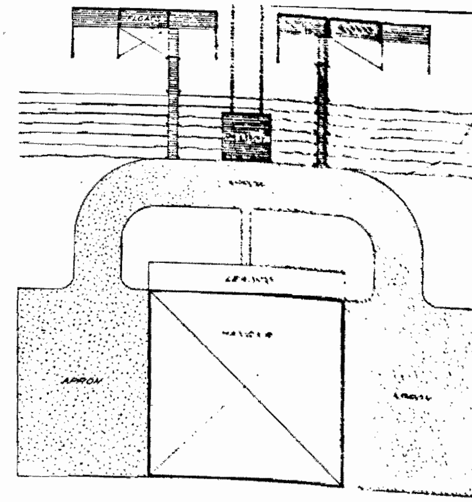
To put the dolly under a ship, the jacking tube is placed so that its ends are in the axle tubes and the shoulders on the tube butt against their inside faces. The clamp provided on the jacking tube to keep it in its extended position is then tightened. The jack is placed under one end of the tube, near the float, and the float is then lifted about 6″.

The two wheel type dolly is effective for handling light seaplanes, the floats of which have no axle tubes and a number of these should be used to supplement the caster dollies outlined above. Two balloon-tired wheels are connected by a long tubular axle lying close to the ground between the wheels. Two rectangular plates are welded to the axle, the distance between the center of the plates being equal to the tread of the floats. A rigid handle projects from the middle of the axle which is braced between the plates for strength and rigidity. To place the dolly in position, the tail of the ship is raised so that the aft part of the keels is off the ground, after that the tail is lowered until the keels rest on the plates. The ship is then balanced and pushed around by its tail. To enhance efficiency in a crowded hangar, the pneumatic wheels might be replaced by steel casters.

While the cost of constructing the typical 15-ship seaplane base just visualized would vary considerably with the design of the hangar selected, an approximate estimate would be:

Hangar with lean-to	$20,000
Concrete foundation, floor and apron	14,000
Marine railway and operating machinery	5,000
Floats and walkway	2,000
Dollies	1,200
Miscellaneous	2,800
TOTAL	$45,000





Passenger landing float for small craft. Right: Suggested layout for 15-ship seaplane base

The cost of the marine railway, like the cost of the comparable ramp, will be found to vary with local conditions. If the rails can be fastened to ballasted cross ties and laid on the bottom, for instance, the cost will be relatively small. On the other hand, if it is necessary to build a pile structure and protect it against severe icing conditions, the cost will increase considerably. Obviously, the size of the base can be varied at will and it is estimated that smaller bases with similar facilities to accommodate five or six seaplanes could be built for between $15,000 and $20,000.

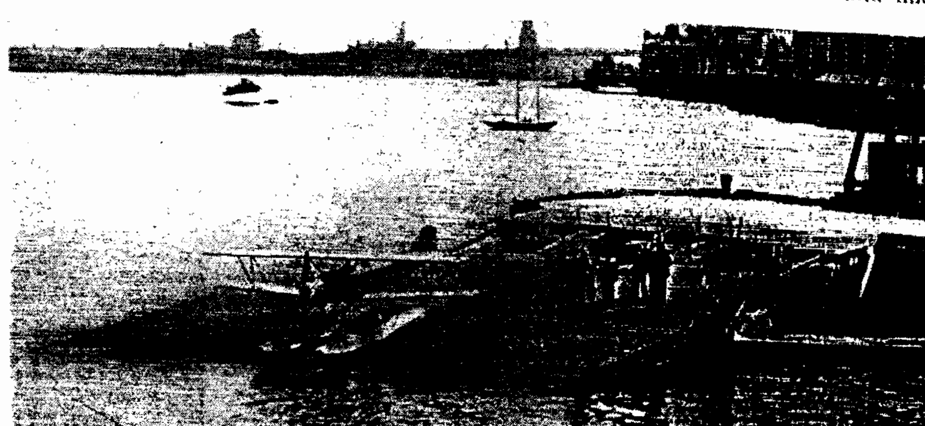
Private Storage Bases

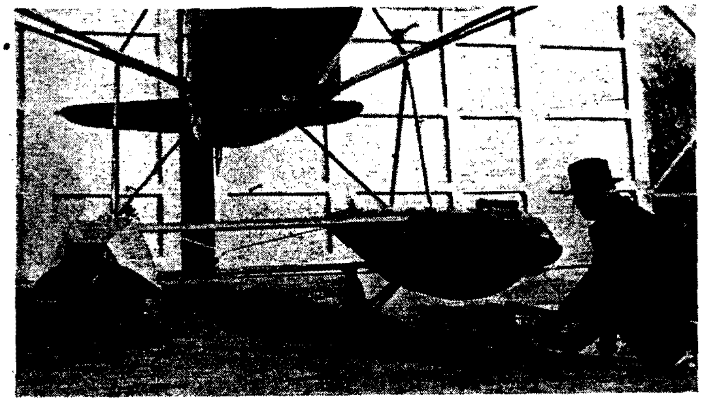
One of the most interesting developments of the past year is the number of one-ship seaplane storage bases, which have been built by private owners as well as operators in various sections of the country. If the development continues, it will likely have an important bearing on the airport congestion problems of the future.

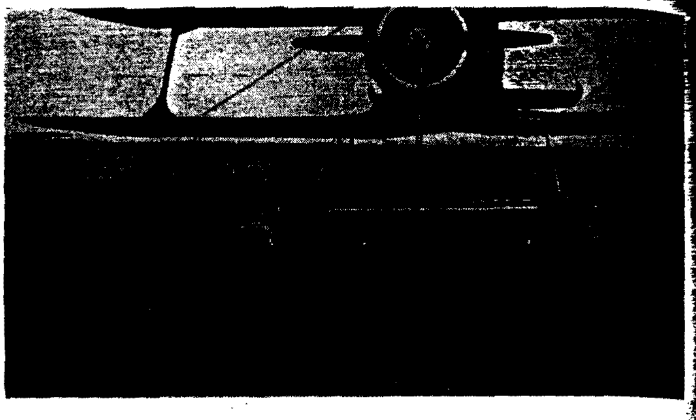
Robert Orrell of Daytona Beach, Florida, has recently completed an unusually well-equipped base to house his Stinson seaplane. It consists of a brick hangar and a marine railway on a pile foundation. The railway is operated by an endless cable, with the power supplied by a gasoline engine winch. At this base, the ship is kept on the railway car which carries it into the hangar. Originally, the problem of turning the ship, end for end, after it is hauled out of the water, presented some difficulty. Skidding the ship around on its keels was ruled out because of the likelihood of damaging the bottoms. The problem was solved by using a piece of heavy pipe, equal in length to the distance between the inner faces of the axle tubes of the floats, and held between them while another piece of heavy pipe is passed through from the outside of one float to the outside of the other. A hydraulic jack is then centered under the pipe to lift the load from the keels after which the ship is easily rotated by hand.

John D. Maher, of Greenwich, Conn., has solved his problem somewhat differently. His hangar is a corrugated steel structure 40′ × 40′ with a smooth planked wooden floor. A wooden ramp laid on the ground with a slope of about one in ten runs directly from the hangar to the water. His method of operation is to ground his Fairchild on the ramp. A manila line

Turntable ramp at the 31st Street East River base in New York City







is then run down from an electric winch in the rear of the hangar and made fast to a rope bridle on the floats. The ship is jacked and placed on a pair of caster dollies by the same method previously referred to and hauled up the ramp into the hangar. In putting the ship overboard, the plane is swung around on its dollies, and the entire procedure reversed. This arrangement has the advantage that if necessary the entire job can be handled by the pilot alone, and in many cases this will be a determining factor in the design of such a base.

Some Special Adaptations

Lloyd Laflin has built a base at Fox Lake, near Chicago, for handling and storing his Aeronca seaplane, which includes an ingenious adaptation of the Boston type dolly. It is a low hung structure with two balloon-tired wheels located at the center of either side of the platform and can be used on any reasonably hard beach. A draw bar connects the end of the platform to the front bumper of his automobile. The dolly is rolled down the beach or ramp by the car until the waterline on the platform is a little higher than the center. The ship is taxied aground on it and made fast by the nose of the floats. It is then ready to be dragged out and pushed into the hangar. To put the ship overboard, the draw bar is attached to the opposite end of the platform and the procedure is reversed. The low cost of this base and the fact that it is a one man operation, recommends it to private owners.

Method of placing caster dollies under a float. Right: Edo three-wheel beaching gear

Franklin Farrell, Jr., was confronted with particularly unfavorable conditions at Pine Orchard, Conn., where he keeps his Aeronca during the Summer months. Because of the rocky shore and general unavailability of waterfront property, the construction of an ordinary base presented difficulties. He met the problem by mooring a floating base or platform in the harbor. The aft part has a built-in ramp, and those parts of the deck on which the keels slide are covered with a thin coating of grease. There is a locker on deck for storing gasoline, oil and miscellaneous gear, and the sides are protected with suitable buffers so that a ship can be made fast there. Since the base always swings with the wind, it is simple to taxi the ship up the ramp and onto the level portion where it is chocked and clamped fast to the deck. It has been found that if a light seaplane was properly fastened to the deck, it could ride out any gale without damage.

An interesting variation of this plan, which might be particularly useful in handling larger seaplanes, would consist of two floats, spaced far enough apart to permit the pontoons of the plane to pass between them, and connected by a number of cross beams beneath the surface of the water. The ship would ground on these beams when taxied in place and, once secured to the floats on either side, should be able to ride out any wind. Such a device eliminates the need of taxiing the ship entirely out of the water.

Efficiency of Marine Railways

It is not possible to develop a set of plans for a single ship base, which would cover every possible situation, for the design will vary according to the weight of the ship, the budget, and whether or not there are attendants. Certain generalities, however, can be pointed out. The marine railway is probably the most efficient device for handling any seaplane except those in the light plane class. It is somewhat easier on the ship than the fixed ramp, and in many instances, the cost of construction is lower. On the other hand, the marine railway must have the assistance of a man on shore if it is to be used most advantageously, particularly where there is tide and constant change of water level. It also involves a source of power and machinery which must be maintained and kept in working order. A marine railway incorporating a turntable in the car, or in a section of track in front of the hangar, would obviously be an advancement in design of considerable value, while a device which would automatically maintain the car at the proper level, as the tide shifted, would eliminate the need for an attendant as well.

The two-wheel dolly for light aircraft. Right: Christensen dolly at Pt. Washington, N. Y.