Flying the Sealand

by Derek D. Dempster

"Aeroplane" photograph

SHORTS' SEALAND is the first amphibian that I have had the good fortune to fly and though, as is expected, there are one or two details that need tidying up, taken in general this versatile aeroplane seems ideally suited for its designed tasks. It can be used either as a five-seater with accommodation aft for passenger baggage, an eight-seater, provided the toilet compartment is removed, or as a complete freighter. It offers a high degree of utilization, in that it can be quickly adapted to varying day-to-day requirements with a minimum amount of time spent on rearranging the interior.

Though the Sealand in its present amphibious form is an aircraft which greatly enlarges the scope of activity of the operator, it is also available solely as a flying-boat capable of taking a greater payload over a more extensive range. The weight saved by the elimination of the undercarriage and its additional structure allows for greater internal capacity and larger fuel tanks, which means that 10 passengers can be carried over stage lengths up to 300 miles.

The layout of the Sealand is conventional, the high wing being necessary to get adequate airscrew clearance. A special feature is the deep large windows providing a first-class view of the scenery, which is likely to be spectacular in places where the Sealand may be normally expected to operate.

Two de Havilland Gipsy Queen 70 engines, each developing 345 b.h.p. for take-off, are mounted on the outboard of the centre section and are fed from two 60-gallon fuel tanks housed in the centre section. Refuelling is by conventional filler cap on the top surface of the wing.

Access to the cabin and the cockpit is by a double door situated on the port side of the fuselage, aft of the rearmost seat, which for normal passenger usage is half opened, and for freight loading opened fully. Climbing in and out is comparatively easy for the young, but requires a step for those whose limbs no longer react in the way they would most desire. On the water there is no difficulty getting in as long as it is fairly calm and the tender is stable.

The cabin is roomy, being 5 ft. 3 ins. high, wide enough to allow unrestricted movement along the aisle without causing inconvenience to any passengers, and soundproofed to minimize the noise. This is very low indeed under all conditions of flight, and conversation in normal tones is possible at all times. Vibration level for a piston-engined aircraft is also remarkably low, and compares well with a turbo-prop aircraft.

The cockpit of the Sealand is delightful. A very neat affair, it has all the levers, switches and instruments concentrated on the panel and on the ceiling, within easy reach of the pilot. There is nothing below the level of the dashboard except the adjustable rudder pedals and a lever to adjust the height of the seat. Such neatness affords a pleasant change after most military aircraft, which, through absolute necessity, have jagged bits and pieces, all of which are of paramount importance, sticking out at all levels.

In normal operational Sealands there is only one set of flying-controls, on the port side of the cockpit, with provision for a radio operator on the starboard side, but the machine I flew, G-AKLO, had been modified and fitted with dual control. This modification made the normally accessible pilot's seat rather hard to get at, and would compel a tall man to bend double while climbing over the back of the instructor's seat.

All flying instruments, which for night flying are illuminated by ultra-violet lighting, are grouped together in a semi-circle round the push-pull wheel-type control column directly in front of the pilot. The engine instruments are collected in the centre, above the throttle quadrant which, in addition to the engine controls, incorporates the trimming wheels for the elevator and rudder.

The radio installation is on the starboard side of the dashboard, but can be remotely controlled by the pilot with his left hand, while the compass is mounted on the left, just below the fire-extinguisher buttons, which, with the feathering buttons, are below the control column.

Fuel cocks, engine air and carburetter air shutter levers, magneto switches, undercarriage indicator lights, brake pressure gauge and ancillary switches are placed on the roof panel, which is low enough to allow the pilot to reach them easily. And yet there is ample headroom.

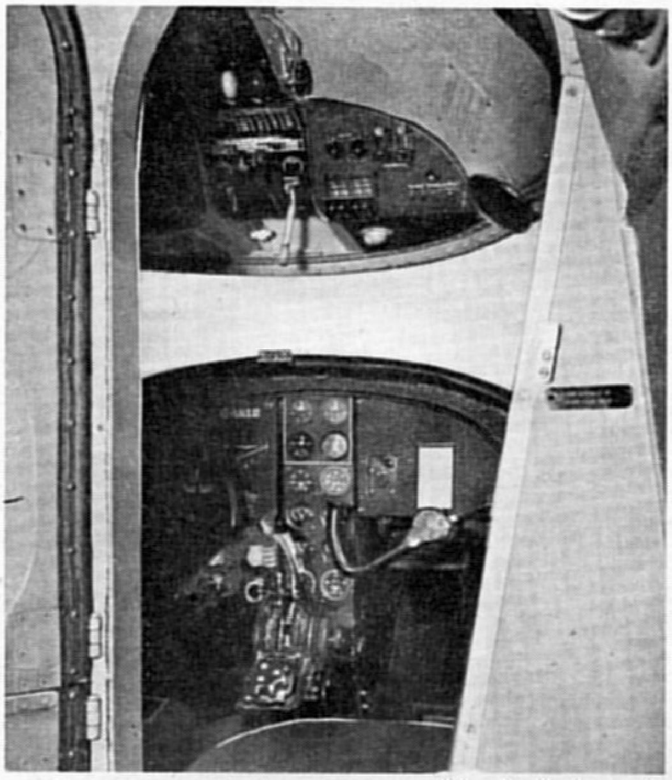
Before passing on to other aspects of the cockpit, namely visibility, I must raise a point of criticism with regard to the flap lever and the reverse-pitch safety gate.

Although the flap lever is conveniently placed, it is difficult to tell by feel the position for take-off flap selection, unless it is moved with the utmost delicacy. It is possible, without realizing, to pull it through to the full flap position. This could—I don't for one moment say the likelihood is strong—lead to confusion under stress.

I would suggest, therefore, that it is modified to move to the take-off position as it does now, but that for full flap selection a catch be incorporated requiring extra pressure to select full flap. On the other hand, a spring-loaded extension to the lever to be pulled down when full flap is required would be equally effective and would make a vast difference to flap selection.

The reverse safety gate, which looks somewhat like a spring-loaded six-inch nail passing through two holes, could do with modification for improvement. How to better it is a matter I leave to the professional designers. It is quite effective in its present form, but most clumsy.

A particularly good field of vision is provided in the Sealand by the one-piece curved windscreen, and the large coupé windows on each side of the cockpit. Even with the head resting on the seat headrest, forward vision over the nose is of a high order, eliminating the need for swinging the aircraft from side to side while taxi-ing over the ground. To the left it is unrestricted and to the right only marred by the width



"Aeroplane" photograph

Simplicity of layout in the cockpit, and good visibility afforded by the single-piece windscreen makes the Short Sealand delightful to fly.

of the cockpit. It is also possible to look back along the cabin and out of the windows at the undercarriage; a good point should the indicator lights fail at any time.

For single-handed mooring operations—apparently quite easy, although I did not have an opportunity of "having a go"—the pilot can slide the side window back to its fullest extent to drop the side panel, and then, with a crook lanyard, to hook the buoy. To complete the operation it is necessary to open the starboard window fully, step out onto the specially built foot ledge, open the nose hatch enclosing the mooring gear, and make the aircraft fast.

Starting up needs little elaboration and is similar in procedure to that of any aircraft with Gipsy Queens. It consist of turning on the fuel cocks, priming where necessary, but not when the engines are warm or when the outside air temperature approaches tropical equivalents.

Throttles slightly open, pitch levers set to give maximum r.p.m., carburetter air intakes open, unless the machine is standing on loose gravel, should find everything ready for pressing the starter buttons. When the engines spring to life they do it so quietly that it is hard to believe they are actually in action. The quietness of the Sealand is perhaps its most noticeable asset.

Oil pressures should rise almost immediately the engines start running smoothly, to 50/55 lb. sq. in. and in cold weather may exceed this until the oil has thinned out.

Brakes hold well during the run-up, and are effective and smooth during taxi-ing. They have a tendency, however, to judder rather badly when the drums are wet, and it happens after the undercarriage has been lowered to act as a drag anchor in the water. The fault is due to inefficient seals, which are being modified to make the brake compartment watertight.

For take-off the trim settings required are neutral for the elevator and about one degree starboard for the rudder. I was not particularly impressed with the trimming controls because they suffer from considerable static friction; but the fault is the subject of a modification which is at present being made.

Throttle friction tight, airscrew safety gate set to prevent the reverse pitch coming into action accidentally, carburetter air intake closed—open when rising off the water—and flaps set for take-off, should see the aircraft ready to go.

Before starting to roll, the throttles should be opened up against the brakes to 2,000 r.p.m. On releasing them power should be increased to 2,800 r.p.m. and plus 6 lb. sq. in boost when the Sealand rolls away, accelerating quite fast and without the slightest suggestion of swinging either way.

The tail rises quickly and the aircraft unsticks in about 450 yards at 65 knots I.A.S. The climb-away must not be started before the aircraft has reached a speed of 85 knots indicated, by which time the undercarriage should have been selected up. Climbing at 85 knots, once the aircraft is well clear of the ground, flaps may be raised and the power reduced to 2,600 r.p.m. and plus 3 lb. sq. in. boost.

Once the Sealand has settled into the climb the carburetter air intakes should be opened at the earliest opportunity. Changes in trim with undercarriage or flap movement are small and hardly noticeable unless you look for the variation.

In the air the Sealand handles with extreme docility and answers well to touches of the controls, but I do feel that some criticism is due in connection with the ailerons. They are spongy and slow to answer, especially on an approach to land or alight in gusty weather. Either the incorporation of balance tabs or an increase in the aileron area would make a tremendous difference to the lateral handling qualities. At the moment there is only a ground preselected trimming tab on the port aileron which, to my mind, is insufficient.

Positive stability characteristics of the Sealand allow it to be flown for long periods hands-off at all normal speeds. These work out at 164 knots at full power; 158 knots at normal climbing power, and 150 knots at maximum weak-mixture cruising power.

Again I must comment upon the low noise and vibration level and the extreme comfort of the pilot's cockpit. I did not have an opportunity of testing these in the passenger cabin itself, but our photographer, who was riding in the aircraft during part of the handling test, was favourably impressed.

There is little to say about the Sealand's stalling characteristics, as they fall into the "gentle" category. Warning of the stall's approach is provided by a slight juddering about 1½ knots above the actual stalling speed. The port wing drops in both the clean and flapped conditions, the first occurring at about 72 knots I.A.S. and the second at 63 knots. Recovery is straightforward and immediate.

With the flap lowered to the take-off position, it is possible to drive the Sealand around like a car at 90 knots with complete safety. This is advantageous in rough and uncivilized regions, because it facilitates the search for suitable landing grounds and alighting strips, if it should be found necessary to use them.

Its single-engined handling characteristics are well worthy of mention because of the remarkably small change in directional trim that occurs when one engine is cut out. Two divisions on the rudder-trimmer indicator suffice to relieve the small foot pressure that has to be exerted on the rudder pedals, when the aircraft is trimmed to the neutral position. Below the critical speed it is possible to hold the aircraft straight without difficulty, but the practice is not recommended because of the closeness to the stall.

To feather the airscrew of the dead engine, the throttles should be closed, the pitch lever moved to the feathering position, and the feathering buttons pressed. As soon as the engine stops, the fuel to it and the ignition switches should be turned off and the balance cock turned on. To restart the engine in flight, procedure is, to all intents and purposes, reversed.

On one engine the Sealand will cruise quite happily at about 105 knots—20 knots above the minimum safety speed—at just a little above cruising power, or at higher speed at emergency climbing power, which may be maintained for an hour. At this power setting on the live engine it may be climbed quite satisfactorily, its performance coming within I.C.A.O. requirements.

Another engine of greater horse-power has been suggested as an alternative power plant, and airframe modifications to take it have been drawn up for its incorporation, should the change become desirable and necessary. This engine would give the Sealand a better climbing performance and cruising speed, which would make it all the more attractive to operators exploiting the Amazon, Borneo and other regions.

A Sealand belonging to an American Missionary Association has been flown a great deal in Borneo, and has, from all accounts, given superb service, in spite of the hard treatment to which it has been subjected. It is said that it was landed and taken off from some of the remotest strips imaginable; places normal pilots would never think of using, even in the event of an emergency.

For a landplane approach and landing, the undercarriage should not be lowered at speeds above 120 knots. Under normal conditions it is lowered at about 110 knots, followed by setting the flaps to the take-off position at about 105 knots. The approach speed should be 90 knots I.A.S. initially, diminishing to 85 knots with flaps fully down on the final run-in over the boundary of the airfield.

The average three-point touch-down speed is about 63 knots I.A.S. On the landing run the aeroplane is quite stable about all axes and normal use of brakes can be made quite early in the process.

On a baulked landing approach, the throttles may be fully opened to 2,800 r.p.m. and the undercarriage and flaps selected up at a convenient height. Changes in trim, as I mentioned before, are small, and retrimming in normal C.G. positions is not necessary.

The C.G. must always be between the limits of 16.56 ins. and

21.6 ins. aft of the C.G. datum, measured parallel to the hull datum. The C.G. datum point is situated on the port side, 18 ins. above the hull datum and 181 ins. from the stem. Maximum permissible all-up weight is 9,100 lb., which does not differ from the maximum landing weight.

There are certain take-off and landing limitations applied to the Sealand when operating from shore bases, namely, that the maximum cross-wind component permitted is equivalent to 20 knots on the starboard beam, the critical side of the aircraft. This limiting figure also applies when taxi-ing on water, but for take-off or alighting is reduced to the equivalent of 10 knots on the starboard beam.

Another limiting factor when flying-off or alighting on water is the condition of the surface, and the Sealand should not be operated in seas greater than one and a half feet. When I flew it I had to contend with one-foot seas on the Medway at Rochester, with winds gusting to 20 knots. Fortunately there was plenty of room and the stretch of water was well protected from the howling elements.

Under calm conditions I understand the aircraft has a natural tendency to yaw to starboard in the initial stages of the take-off run, but by leading with the starboard engine and judicious use of the lift spoiler on the leading edge of the port wing, it is quite easy to keep straight. The lift spoiler, which is operated by a small lever on the flying control handwheel, must only be used during take-off from water at speeds below 50 knots. If the wind component is above five knots there is no need to use it at all.

Landplane pilots, as I am, will consider that an awful lot of juggling has to be done with the stick, by comparison with a landplane, while getting the aircraft to plane, and then to become airborne. After that, handling reverts to normal. To begin with, having selected an obstruction-free path, the stick is moved fairly far forward for the initial run to gain speed. Throttles are opened—the starboard one leading—fairly judiciously until full power is reached. Meanwhile, the ailerons are set to lower the port wing, alternating rapidly at times, depending entirely on the individual take-off, with opposite aileron, to keep the aircraft laterally level.

As the aircraft gathers speed the stick is drawn back gently, not too far, however, as the aircraft must not be put into the three-point attitude, even when it starts to plane on the step. After it is up on the step, the manœuvre becomes progressively easier. But, until that moment arrives, it is necessary to give occasional rapid forward thrusts to the stick to keep the aircraft level and prevent porpoising. As any experienced boat-man knows, unchecked porpoising can lead to disaster.

Once the aircraft is airborne it should be flown level with the surface until sufficient flying speed is reached to start the climb.

Perhaps, as a landlubber, I paint a rather dismal picture, but readers can rest assured that, provided they have sufficient flying experience, it will take them but only a short time to master the technique of flying off water.

Alighting, on the other hand, presents no difficulties to the uninitiated. The approach is identical and the flare-out the same, but the hold off should be made with a small amount of throttle and in an attitude equivalent to that of a tail-down wheel landing; not a three-point landing. This is important to remember because the aircraft is likely to be thrown off, especially in a rough sea, should it be set down in the three-point attitude.

Once it has touched down, the throttles may be closed fully. The aircraft will pull up in a very short space, and sink in to its normal waterline level.

When flown on, contact with the water should be made at 80 or 85 knots I.A.S., depending on the weight. The required rate of descent of 150 ft.p.m. for this type of alighting is accomplished by using power settings of 2,600 r.p.m. and minus 4 lb./sq. in. boost.

Water handling is very good, especially with the standard reversible-pitch airscrews that are fitted to the Sealand. It responds immediately to sudden changes of direction when moving backwards or forwards and can be turned almost on its own axis, which is an advantage when operating from narrow rivers and channels.

To throw the airscrews into reverse pitch, the procedure is to open the safety gate and to push the required pitch lever through to the fullest extent of its travel. Care must be taken not to exceed 2,000 r.p.m., a maximum oil temperature of 100 degrees Centigrade and a cylinder head temperature of 280 degrees Centigrade. The latter is most important.

To revert to normal pitch the lever must be pulled back to the full coarse pitch position and then returned to the fine pitch setting.

The installation of the reversible-pitch airscrews is a great advantage. It widens the Sealand's utility inasmuch that in an emergency it may be run gently aground on a sand- or mud-bank, and floated off again without the slightest need for manhandling. Although this practice is not recommended by the makers, it seems to me that little harm can come to the aircraft, because of the construction of the hull. It is almost like a battleship's.

The Sealand can be taxied with its wheels down direct from the water up a slipway with a gradient of as much as 7 degrees, which is a useful asset.

To stop the engines the procedure is to allow them to idle at 1,000/1,200 r.p.m. until they have cooled evenly, throttle back fully and to bring the slow-running cut-outs into action until the fuel pressure drops to zero. Then switch off.

For parking, a locking device in the cockpit renders the engine and flying controls inoperative.

In conclusion, the Short Sealand amphibian is an aircraft that will appeal to many types of operator. It has everything that is required of an aircraft of its type and should go far towards linking the remotest outposts with civilization. Of course, before giving it an unqualified "carte blanche" the small points I criticized should be looked into.

Finally, I do hope that Shorts will manage to follow up the demonstrations, already given by the Sealand in so many places, by further exhibitions round this watery world. Shorts have in it a combination of all that is required of a machine of its type, so that it has tremendous possibilities. Moreover, the price is reasonable by comparison with other amphibians.

Technical Data

Dimensions.—Span, 59 ft. (18.0 m.). Length, 42 ft. 2 ins. (12.84 m.). Height (keel to top of rudder), 15 ft. (4.57 m.).

Weights.—Weight empty, 6,975 lb. (3,170 kg.). Payload, 1,400 lb. (635 kg.). Gross weight, 9,100 lb. (4,150 kg.). Wing loading, 25.8 lb./sq. ft. (126 kg./sq. m.).

Performance.—(Estimated at 9,100 lb.) Max. speed, 189 m.p.h. (304 km.p.h.) at 5,200 ft. (1,580 m.). Cruising speed, 175 m.p.h. (282 km.p.h.) at 6,300 ft. (1,920 m.). Initial rate of climb, 840 ft.p.m. (4.26 m.p.s.). Rate of climb at 10,000 ft. (3,050 m.), 745 ft.p.m. (3.8 m.p.s.). Service ceiling, 20,600 ft. (6,300 m.).

Noteworthy characteristics of the Sealand are its high aspect ratio wings and deep hull.

"Aeroplane" photograph