

Felixstowe F2A on Lighter H3 probably off Felixstowe.

:RAF Museum PC 71/19/983/42

LIGHTERS

COMPILED FROM THE PUBLIC RECORDS

BY MICHAEL H GOODALL

All photos via the author
unless indicated

At the end of September 1916 the late Commander Porte, of the Royal Naval Air Station, Felixstowe, proposed to extend the radius of action of the large 'America' flying boats by building some special craft, strong enough to be towed at 20 to 25 knots behind destroyers and arranged to take a flying boat on board each. A rough sketch indicating the requirements was supplied, and the suggestion was made that these craft should be submerged by flooding tanks, the flying boats floated in and raised clear of the water suitable for towing, by ejecting the water from the tanks by compressed air.

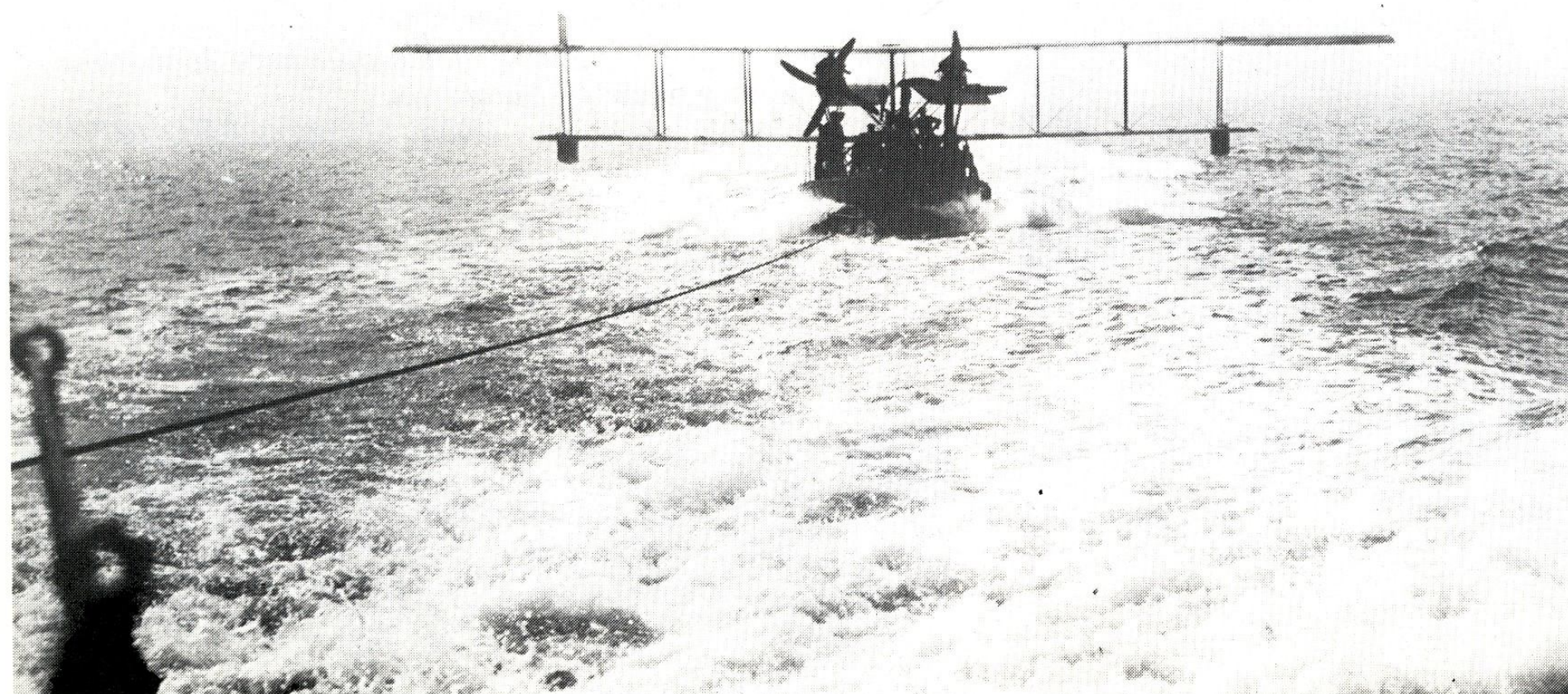
On 5 October two representatives of the Directorate of Naval Construction (DNC) visited Felixstowe to investigate the conditions, and a design was immediately afterwards commenced. Steel construction was adopted, so as to use part of the hull as an airtight trimming tank, and it was decided that, instead of arranging to submerge bodily, the lighter should be designed with a large

trimming tank aft, so as to submerge the after end and enable the flying boat to be hauled up by a winch fitted on the foredeck. The weight of the flying boats to be accommodated at that time was 4¼ tons.

Lines The form of the lighter was arranged with a chine, for towing at high speed, and was made very flat aft, and sufficiently 'V-shaped' forward to enable her to surmount seas without pounding severely.

The beam was arranged to be sufficient to house the flying boat and to provide side decks in addition on each side for working purposes.

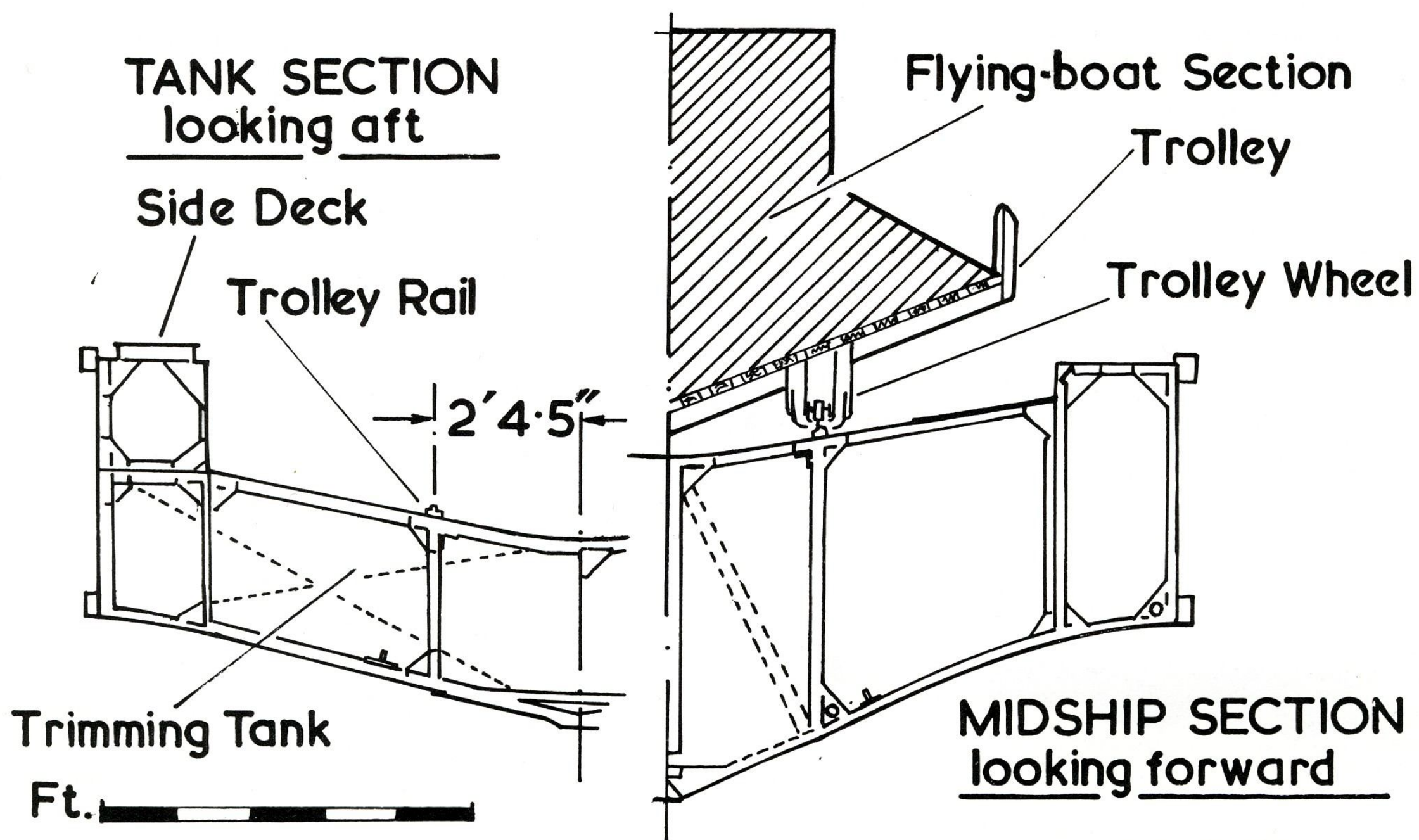
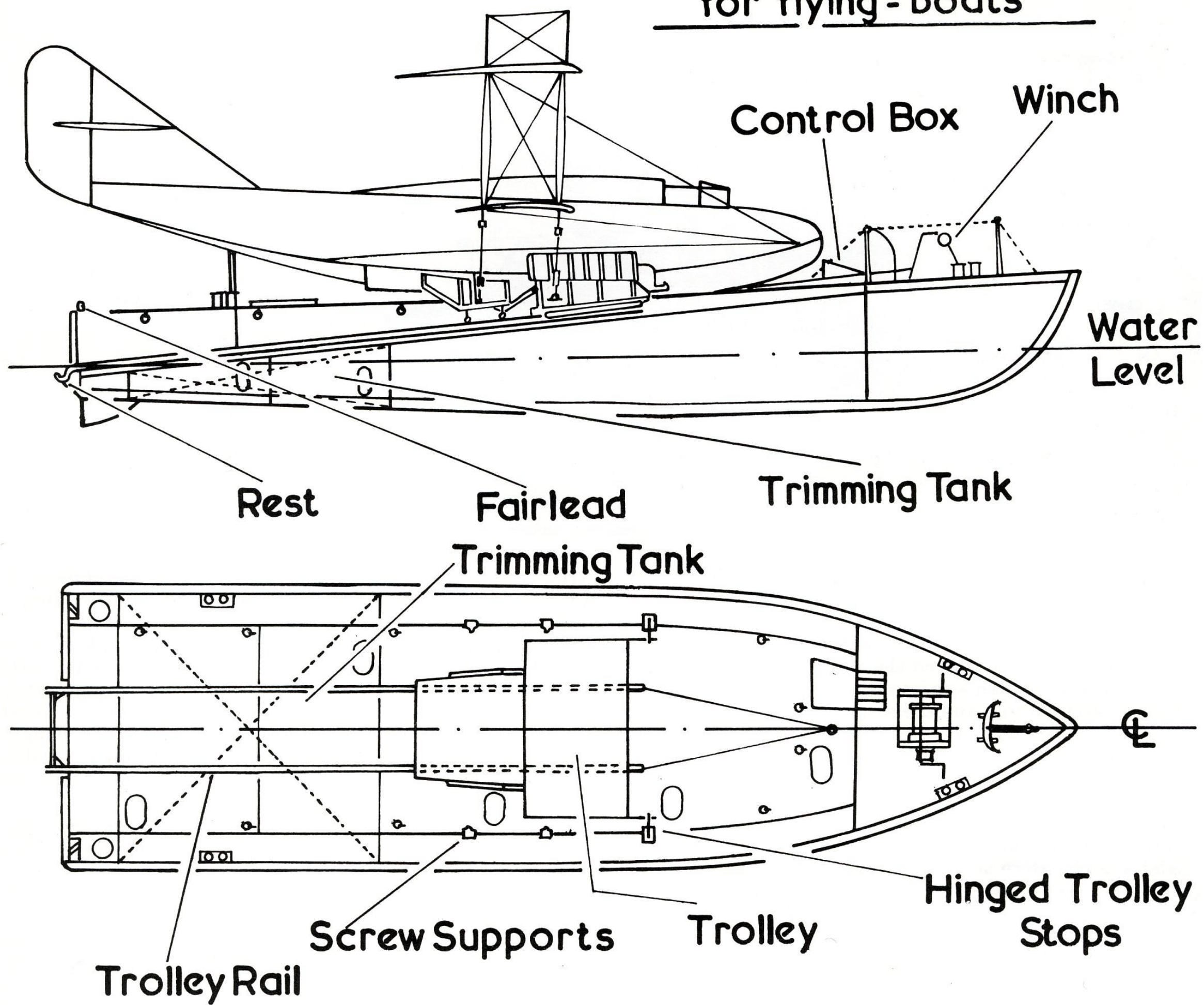
Towing was arranged by means of a bridle attached to the sides above the chine about 12 feet abaft the stem head, and in order to keep the lighter on a straight course three plate skegs were fitted under the bottom aft, no rudder being used. The form as at first designed had straight line sections ending on the chine. This form was sent to the Admiralty Experiment Works at Haslar for model



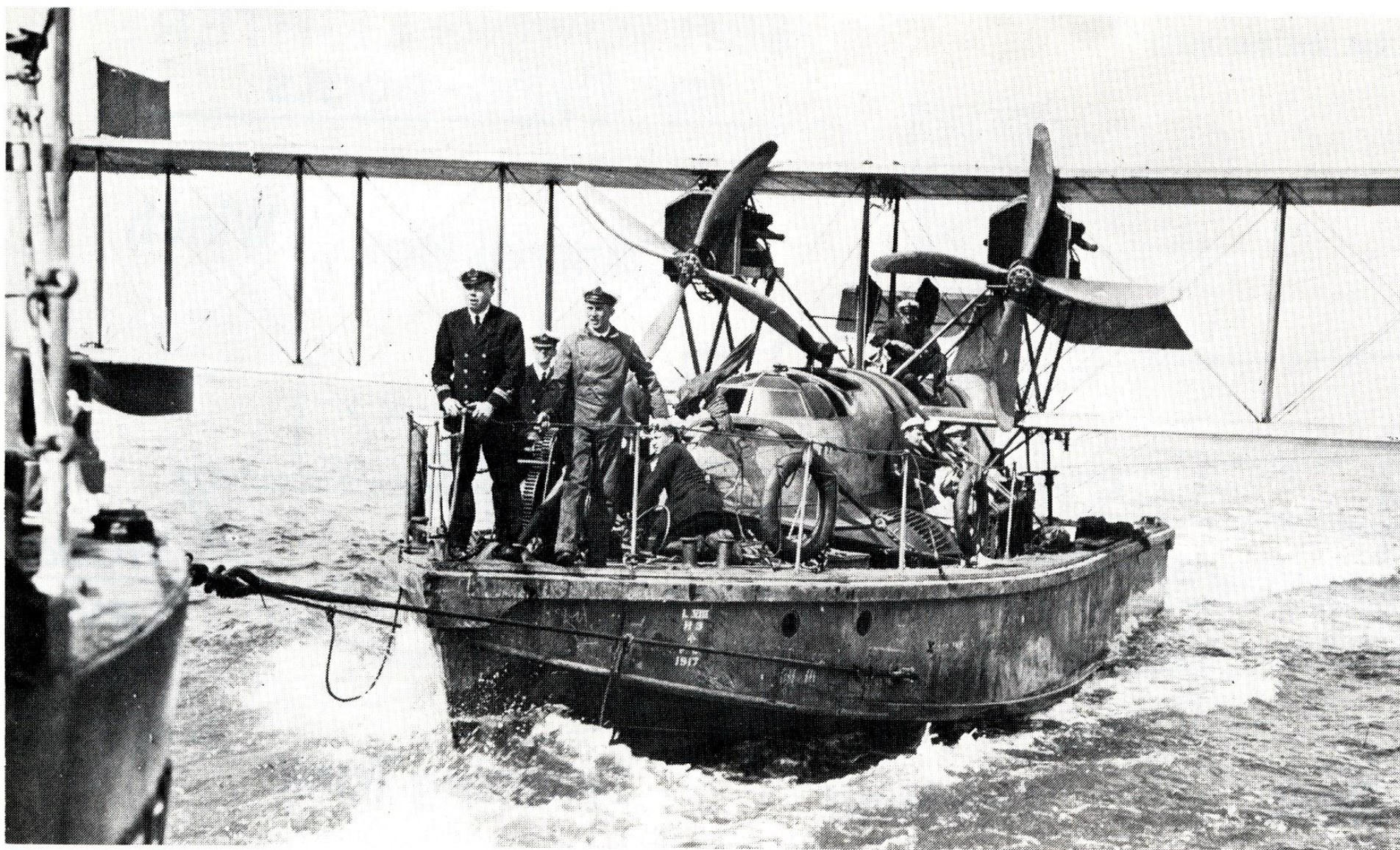
*Felixstowe F2A
being towed at high
speed.*

Ft. 

58ft TOWING LIGHTER for flying-boats



:Traced by P G Cooksley from original Admiralty document



*Lighter H3 with
Felixstowe F2A on
board being towed
on a short line.*

experiments to be made, but they showed that the form as designed was unsuitable, as at a speed corresponding to about 30 knots the model threw up a solid sheet of water to a height corresponding in the actual lighter to 8 or 10 feet, which would have smothered the wings of the flying boat.

A modified lines plan was immediately prepared, in which the chine was lowered and the sections were made concave just below the chine, so as to give more lift and throw down the water.

These modifications were made on the wooden model previously used by casting on in wax, and the result was very successful, as the resistance was reduced and the trouble with the bow wave was overcome. This modified model was therefore adopted.

General Arrangement (Plates I and II) The lighter was divided up by five main transverse WT bulkheads. The foremost compartment was fitted up as a storeroom, and was also used as a place where the flying boat crew could obtain shelter under tow. The aftermost compartment was a small one, used only for the stowage of the permanent trimming ballast. The next compartment from the stern, between bulkheads 30 and 45, was the trimming tank, which could be flooded by means of a 10 inch Kingston valve at its forward end. The capacity of this compartment was arranged to give, together with the permanent

trimming ballast, sufficient draught aft over the slipway to enable the flying boat to be floated in, while providing a working gangway on each side.

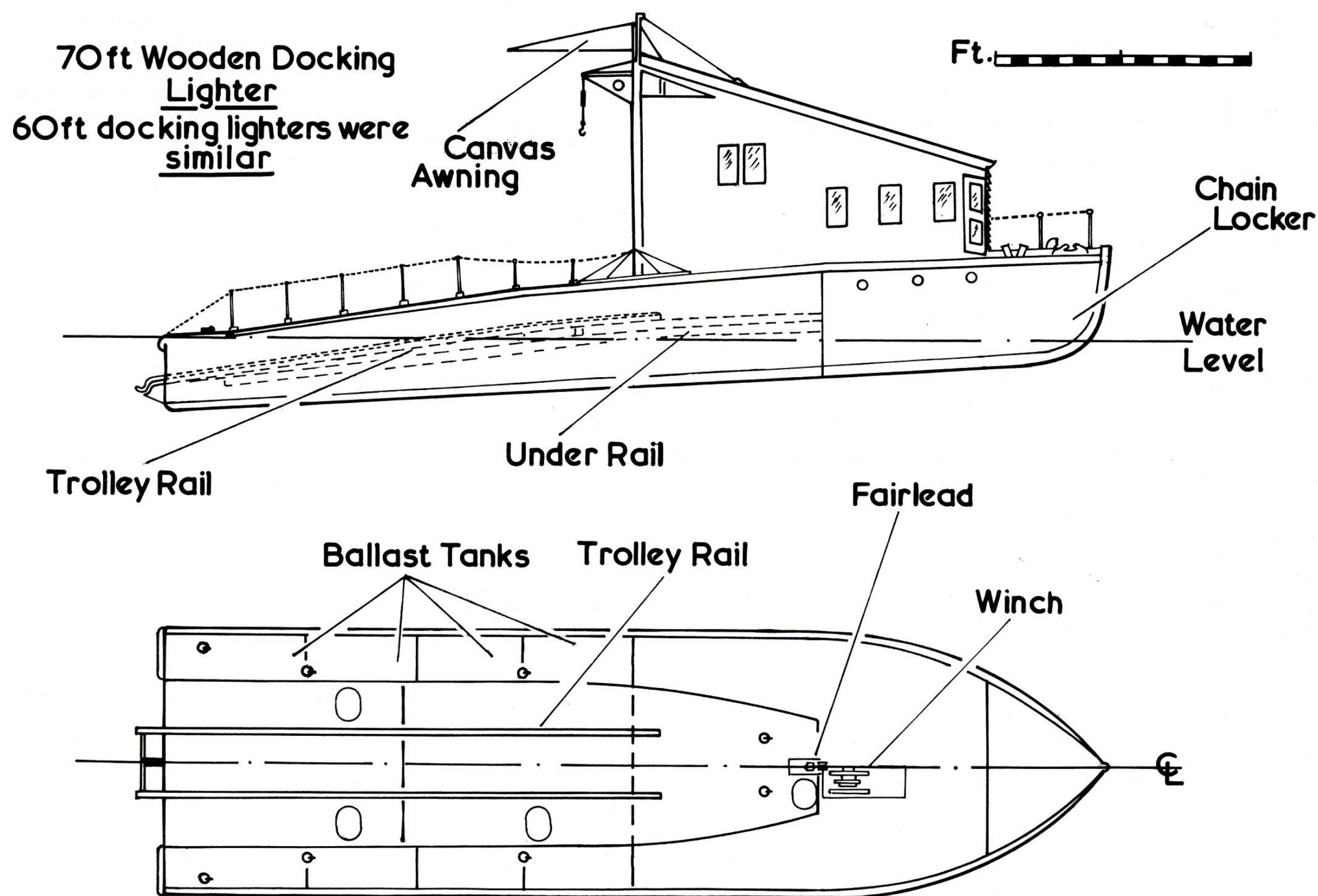
For expelling the water from the trimming tank four air bottles were provided, which were stowed below the side decks aft, having a total capacity of about 10.8 cubic feet of air at 2500lb per square inch pressure. This amount proved sufficient to blow the tank twice. The admission of the high-pressure air to the trimming tank was controlled by a valve at a control station forward, from which also the Kingston valve was operated.

Contract for First Four Boats The design, having been completed and inspected by Commander Porte, was submitted to the Board, and at the end of January 1917 an order was placed with Messrs Thornycroft, of Southampton, for four lighters.

Trolley It was at first intended to fit greased wooden ways on the slipway and to haul the flying boat directly up these by means of the winch. Owing, however, to the fragile construction of the flying boats it was ultimately decided that a cradle on a trolley running on rails was necessary. The chief difficulty in arranging a satisfactory cradle was caused by the flying boat having a projecting step just below its centre of gravity, which in launching would foul any support arranged abaft the step, unless the support



*Felixstowe F2A
being winched
aboard a lighter at
Felixstowe. In the
background are the
hangars of the 'Air
Station' and behind
and to the left are
the buildings of the
old Felixstowe
docks, including the
public house 'The
Little Ships'.*



was portable, and if made portable it would be very difficult to fit in place until the flying boat was clear of the water. This difficulty was overcome by designing a special auxiliary trolley hinged to the main trolley and arranged to hinge down automatically out of the way when the trolley was in its aftermost position. The trolleys were built up to form a suitable cradle to receive the flying boat.

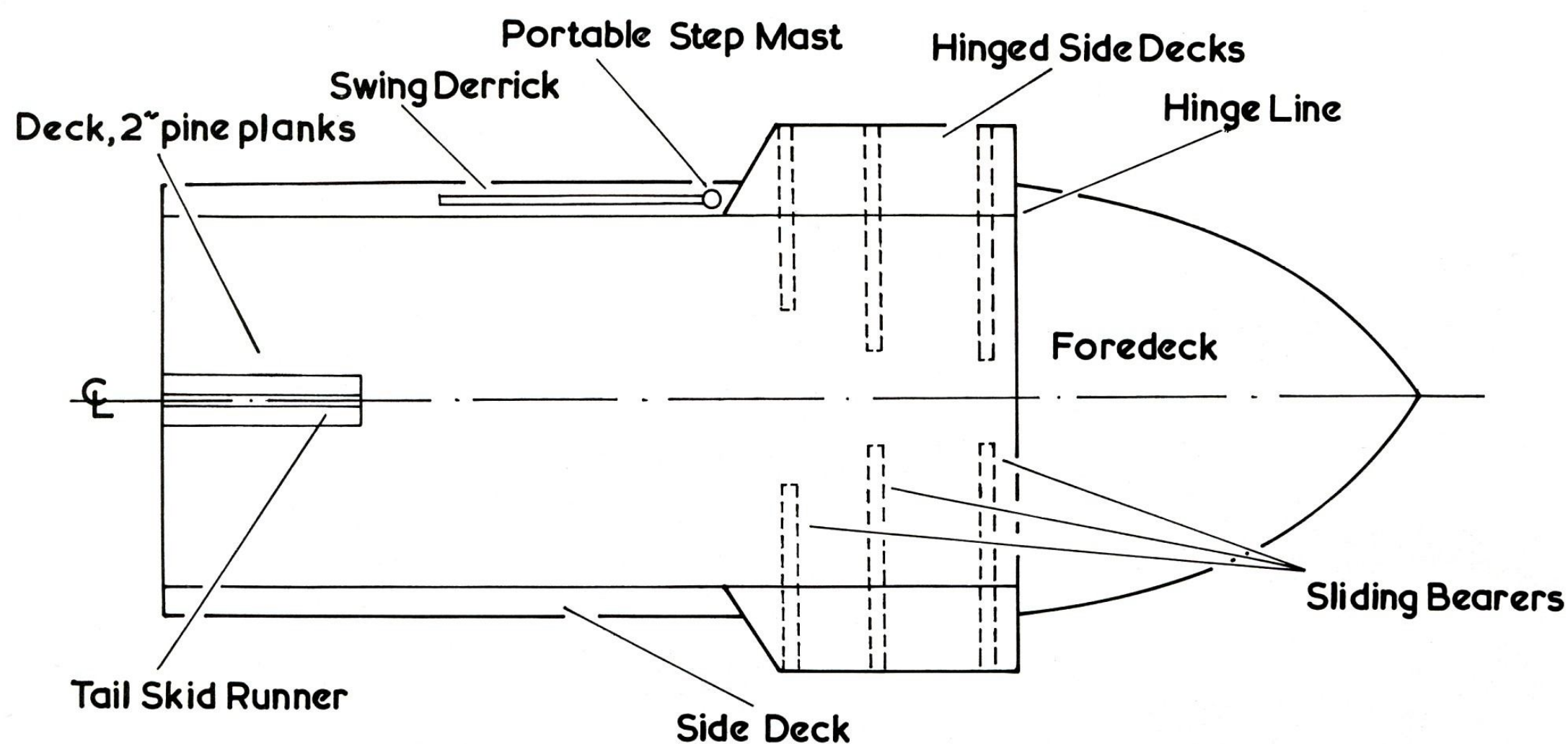
Completion Completion tests of the first lighter took place at the builders' works on 18 June 1917, and trials at Calshot, in which a flying boat was satisfactorily hauled up and re-launched, were carried out shortly afterwards, followed by towing trials behind a destroyer in the Solent, which proved very successful.

Orders for 50 more Lighters In view of the success of the first lighters, the Director of Naval Air Service at that time proposed in July 1917 to place orders for 50 more, which should be arranged to accommodate the H12, F2 and F3 types of flying boats. The Board decided before doing this to await further trials in the North Sea.

These trials were carried out on 3 September in calm weather up to about 32 knots, and Commodore Tyrwhitt reported that he considered the trials quite satisfactory and the design suitable. It was therefore decided to order 25 more lighters; this number being subsequently increased to 50.

Meanwhile it had been decided that future construction

FELIXSTOWE AEROPLANE DECK FITTED TO TOWED LIGHTER



:Traced by P G Cooksley from original Admiralty document

should be arranged for by the Deputy Controller of Auxiliary Shipbuilding, and after slight modifications to plans and specifications to embody a few improvements found necessary and to enable the lighters to take the new 'F' machines, the latest of which (type F5) weighed about 5½ tons, the construction of these lighters was handed over to DCAS, and subsequently passed to the Director of Auxiliary Vessels on the formation of the latter department.

The building of the lighters was undertaken at the new Government shipyard at Richborough and was carried out by Royal Engineers, the first of the 50 boats being completed in May 1918, and 31 having been delivered by November 1918. Further construction was stopped soon after the signing of the Armistice, and only five more completed, the remaining 14 being cancelled.

The average period of construction for each lighter was about 10 weeks.

The first 25 lighters had all their steelwork galvanized, but owing to the urgency of delivery this process was omitted in the remaining lighters.

Two lighters were built on each berth in the yard at Richborough, and construction was proceeded with on four berths accommodating eight lighters at one time. All the steelwork was templated, including girders, etc. Air tests were carried out for trimming tanks, and vessels were practically completed on slips before launching.

Method of Operation The usual method of operating these lighters was as follows:— The trimming tank was flooded by opening the Kingston valve, the cradle having first been run to its aftermost position. The flying boat was then floated on to the cradle, and when adjusted in position the cradle and boat were hauled up by means of the winch. Meanwhile air was admitted to the trimming tank and the water expelled, causing the stern of the lighter to rise, which, by reducing the slope of the slipway, facilitated the hauling of the cradle and flying boat into the stowing position.

Special supports were arranged from the side deck at the stowing position to engage with special fittings on the strongest part of the lower planes of the flying boat. These acted both in tension and compression, and both held the boat down and supported it in a seaway. An additional portable padded prop was used to support the tail.

The lighter with its load was then taken in tow by a destroyer, and if an opportunity for action occurred the destroyer slowed down and the operation described above was reversed, and the flying boat was launched to carry out the plan of action and fly back to its base.

The lighter, after being cleared of the water by blowing the trimming tank, was towed back to harbour.

Suction Device With a view to conserving the air supply and enable the flying boat to be re-shipped at sea if

necessary, trials were carried out early in October 1918 of a device, proposed by Mr Rouse, Assistant Constructor, for emptying the tank by suction produced by towing. This device consisted of a small reversed scoop or deflector fitted on the bottom over the Kingston valve, an auxiliary Kingston being fitted for flooding when under way. These trials proved very successful, the tank being emptied by the suction in about six minutes when towed at 15 knots.

It was decided to fit the remaining lighters with this device, but the signing of the Armistice intervened.

General Particulars of the 58ft towing lighters were as follows:

Length (overall) 58ft, beam (outside of plating) 16ft, depth (keel to side of deck amidships) 7ft.

The draughts, as arranged by ballasting to take the F2, F3 and F5 flying boats, were as follows:

With trimming tank empty, no men on board, cradle in stowed position and with no flying boat on board: Forward, 3ft above bottom of keel produced. Aft, 2½in below inner bottom at centre.

The corresponding displacement was 24 tons, and the displacement therefore with F5 flying boat and crew on board would be about 30 tons.

After shifting the cradle to its aftermost position and flooding the trimming tank the resulting draughts became: Forward, 11in above bottom of keel produced. Aft, 3ft 4¼in above inner bottom at centre.

The maximum air pressure in the trimming tank while ejecting the water was about 4lb per square inch, the relief valves being set to operate at 5lb per square inch, and the time required to empty the tank was found to be about 2 minutes, the amount of water ejected being about 17 tons.

Flying-off Platform (Plates III and IV). In the summer of 1918 it was considered desirable that a few of the lighters should be fitted with wooden flying-off platforms, to accommodate each a small 'Camel' aeroplane.

It was first suggested that portable flying-off decks should be fitted, but this was found to be impracticable and fixed decks were decided upon, 12 lighters being so fitted.

The results of trials showed that 'Camel' aeroplanes could be flown off from these decks satisfactorily in good weather conditions, and considerable importance was attached to this method of using aeroplanes, especially for daylight attacks on Zeppelins and for fighting German seaplanes near to their own bases.

These decks were of 2 inch pine stoutly supported and securely braced in all directions, the main uprights being through fastened to the inner sides of the lighters. The platform extended from the foredeck of the lighter to right aft, and was so arranged as to be approximately parallel to the towing water-line at high speeds. Wing decks forward, which overhung the lighter each side some 4 feet, were hinged to fold back and so prevent damage when coming



Lighter with modified take off platform for a Sopwith Camel. Note painted outline of aircraft plus shadow on the deck. It could be that this was meant to create the impression that a Camel was aboard the lighter after it had in fact taken off. Bearing in mind the height at which Zeppelins operated this might have been a practical deception.

alongside a destroyer; the beams supporting these side wings were made so as to slide inwards.

A derrick was fitted to the lighters to enable the aeroplane to be salvaged, if possible, though in most cases, apparently, the machine was lost.

SEAPLANE DOCKING LIGHTERS

The success of the H8 type of flying boat in action in 1917, and the desirability of extending its use beyond the limited number of seaplane bases provided with suitable sheds and slipways, led to the preparation of a design for a floating shelter for these boats, such that the flying boat's hull might be drawn completely out of the water and the body, engines, and central portions of planes protected from the weather.

It was desirable that these docking lighters, or floating docks, should be capable of being towed from port to port in fine weather and in the light condition.

General Arrangement of First Two Lighters (Plate V) The proposal of DNC to meet these conditions took the form of a wooden lighter, 60 feet in length by 18 feet beam, with the after part open to the sea. A forecastle deck, side decks, and inner bottom were features of the design, as in the towing lighters. Two lighters were built in accordance with this design.

The inner bottom was divided into two parts by a transverse bulkhead, the after part forming a water ballast tank for the purpose of sinking the after part of the inner bottom below the sea level, in order that the flying boat might be floated in. The water could be admitted to this compartment by means of a flooding valve in the bottom of the lighter.

A trolley running on rails, generally similar to the one in the 58 feet seaplane towing lighter, was used for carrying the flying boat up the inner bottom of the lighter, a hand windlass being fitted on the forecastle deck for hauling purposes.

A hand pump, with the necessary suction pipes, was originally fitted to deal with any bilge water getting into the compartments and to pump out the ballast water, but after trial this was found to be inadequate, and a rotary pump driven by belt gearing from a petrol motor was subsequently fitted.

A forecastle compartment was provided, fitted up as a storeroom with lockers, etc. Access to this was by means of a hatch on the forecastle deck. Six steel tanks were fitted at the after end of the lighter on the inner bottom, three on each side under the side decks; these tanks being used to supplement the water ballast in the ballast compartment, so that sufficient depth of water might be obtained over the inner bottom and also to increase the longitudinal stability of the lighter.

A house, open at the after end, was fitted over the fore part of the inner bottom abaft the forecastle, the roof being

continued aft beyond sides of the house to form a canopy over the engines, etc of the flying boat. The height of the side decks above the inner bottom was such that a flying boat could be drawn up the slip when carrying bombs under the planes.

Bollards and fairleads were fitted on the forecastle deck and a 2cwt anchor and 50 fathoms of $\frac{1}{4}$ inch cable supplied. **Additional Lighters** (70 feet long) (Plate VI) It was subsequently approved to order 12* more lighters, with additional accommodation and appliances capable of lifting the engines out of the flying boats when docked. This necessitated increasing the dimensions, and a design was prepared for a lighter generally similar to the above, but of 70 feet length and 19 feet beam. The inner bottom compartments were increased to three, the two after ones being used as water ballast tanks with flooding valves fitted to each and a steel middle-line wash bulkhead to increase the stability of the lighter.

The house was to be of increased size, built partly over the forecastle deck. The fore part of the house was fitted as a workshop, with bench, washing tray for engine parts, and a wc. The overhanging canopy at the after end of the roof was built of steel angles and canvas, instead of wood as in the previous lighters.

A channel bar was fitted at the after part of the house on each side of the lighter, built into the lighter at the lower end and the channel bars connected to each other at the roof of the house by a transverse angle. These channel bars were of sufficient strength to take a bracket on each for supporting the planes of the flying boat while the engine was being removed, this latter operation being done by means of jib cranes secured to the channel bars, one on each side of the lighter.

A similar pumping set to those in the previous 60 feet lighters was provided, the pump and suction pipes being connected up to a valve box, with a connection to take a hose for pumping out the flying boat. A combined petrol and paraffin tank of sufficient capacity for six hours' running at full output, with the necessary fittings, was supplied with the pumping outfit. Stowage was also arranged under the side decks for 250 standard 2 gallon petrol cans and a 25 gallon oil drum.

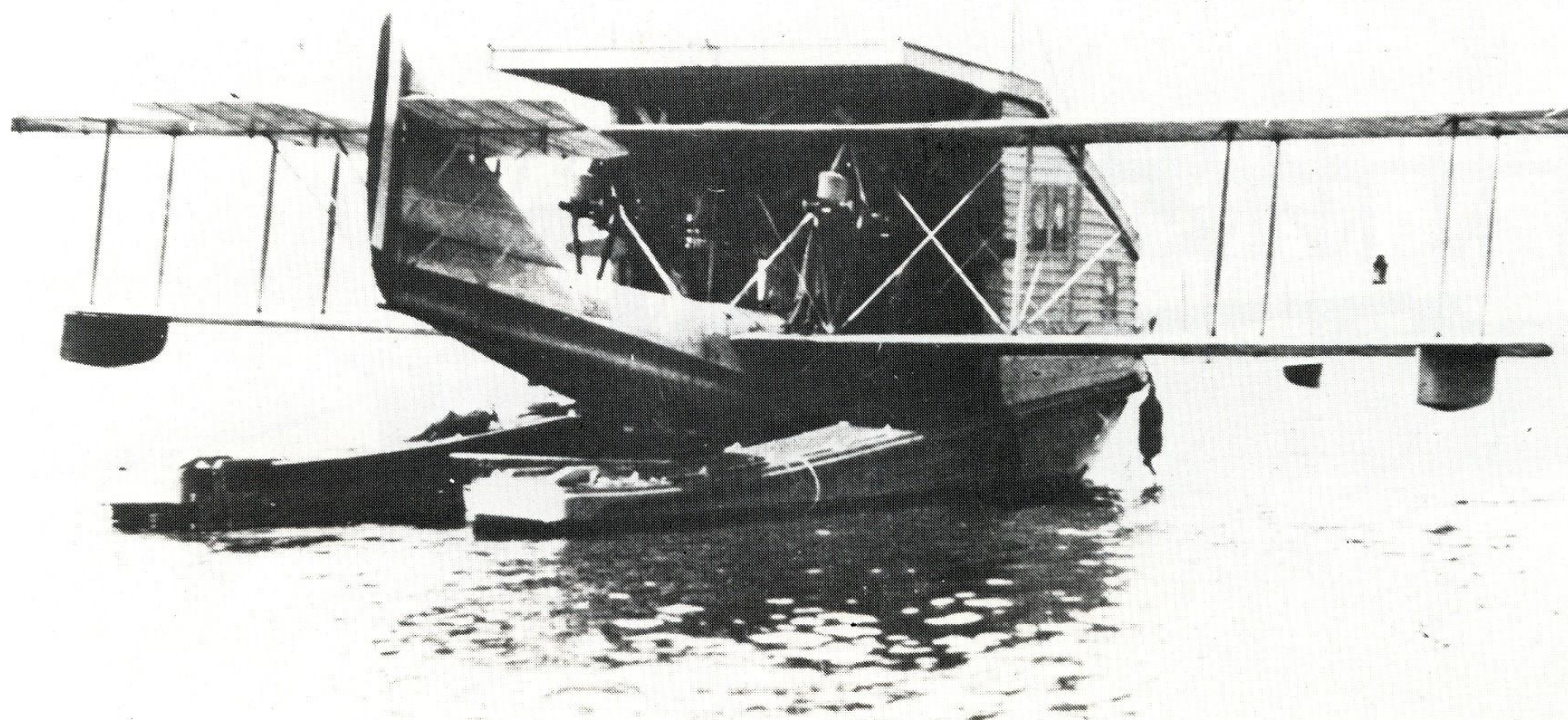
Bollards and fairleads were fitted on the forecastle deck and a cleat amidships on each side for use when towing the lighter from one mooring to another.

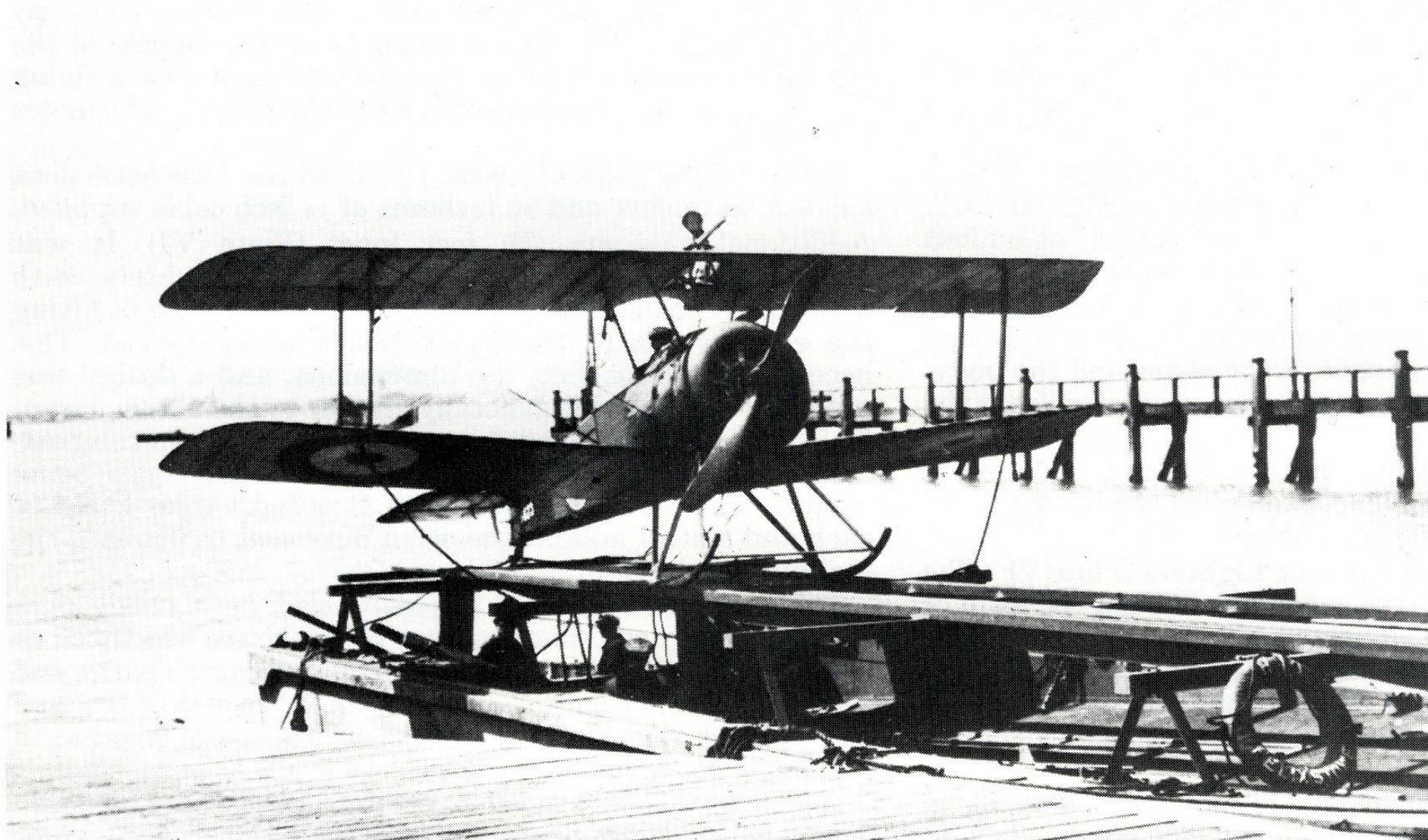
A 3cwt Admiralty Pattern V anchor and 50 fathoms of $\frac{1}{16}$ inch chain cable were carried, a light derrick being fitted for hoisting the anchor.

* Two of these were subsequently cancelled.

(The foregoing is an extract from the Admiralty History of Aircraft Carriers published in 1921 — contained in PRO file AIR 1/2103)

Curtiss H12 aboard a Docking Lighter.





Sopwith 2F1 Camel aboard lighter H3 at Felixstowe. Note that the Camel is fitted with skids in place of its normal wheeled undercarriage. The date is 29 May 1918 — the day before Commander Samson's first attempt to take off whilst being towed.

The original intention was to enable Felixstowe Flying Boats to carry out bombing attacks on the German naval bases at Wilhelmshaven and Kiel — the advanced take-off facility required less fuel to be carried and thus allowed a greater bomb load. However, they were first used for reconnaissance flights in the Heligoland Bight. Their first operational use was on 19 March 1918, when three lighters were towed by destroyers to a point near the German coast. Take-off was made at 07.00 hours and, in the course of their patrol, the flying boats were attacked by two enemy seaplanes, one of which was shot down.

Their long-range bombing function was cancelled in July 1918, by which time land-based bombers had been deployed for this task, but the lighter-borne flying boats carried out several more successful fighting patrols off the German coast up to the end of the War.

One of the Navy's original pilots, Colonel C R Samson, made the first attempted take-off from a lighter in a Sopwith Camel 2F1 (N6623) on 30 May 1918. Samson had written from HQ 4 Group on 3 May 1918 asking the Admiralty for the loan of a lighter for trials. The Camel had been fitted with twin skids which ran in a pair of wooden troughs which extended the full length of the lighter. The purpose of the troughs was to keep the aircraft straight at low speeds so that it would not go over the side of the

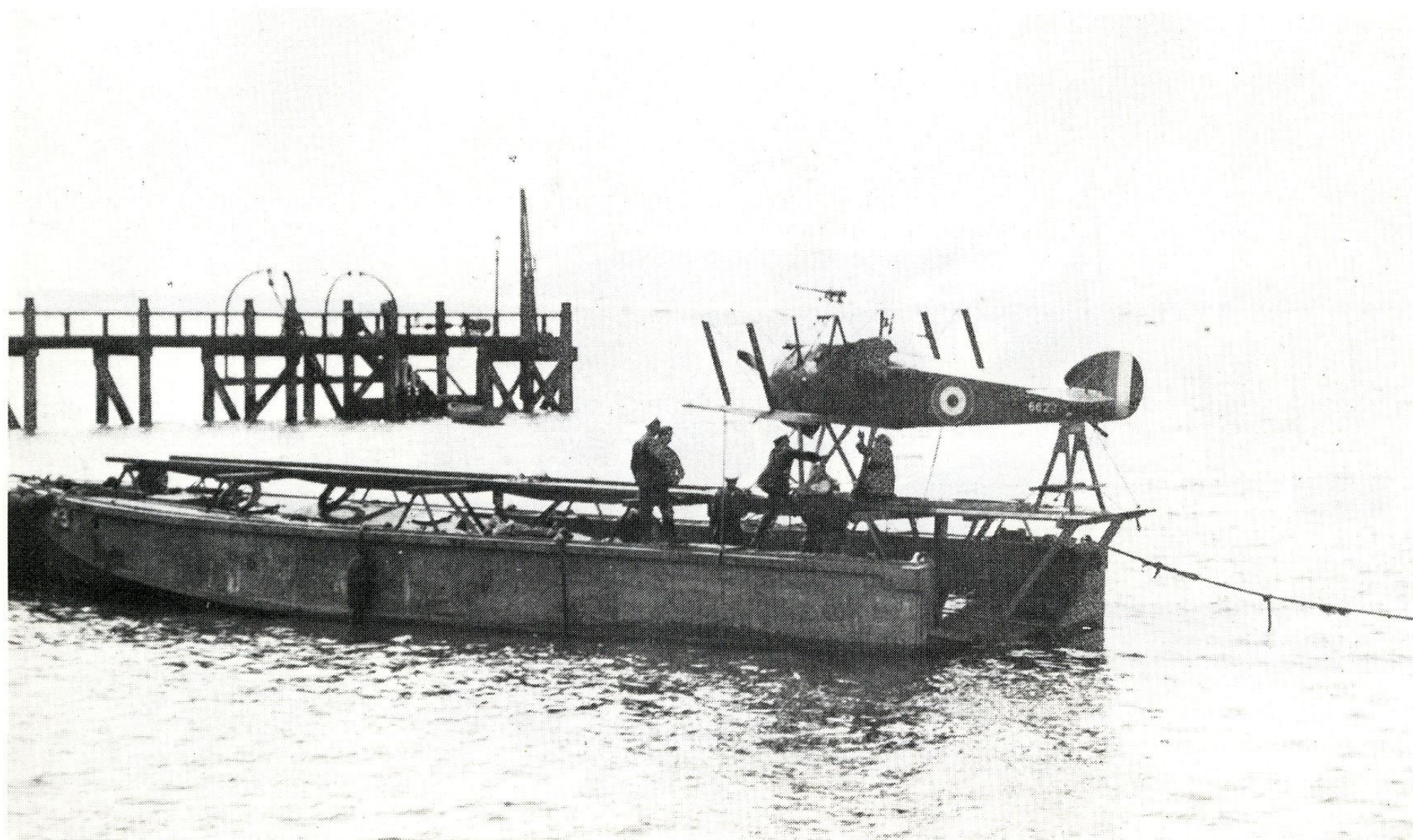
lighter before it was airborne. The troughs and skid undercarriage were designed by Samson's old friend H H Busteed. During the initial trials the lighter which was a conversion of one of the seaplane towing craft (No H3) was towed by the destroyer *Truculent* off Orfordness.

Unfortunately, it had not been realised that, when towed at high speed, the lighter had a marked stern down attitude, which meant that the Camel was attempting to take off from a platform which sloped steeply uphill. This reduced its take-off speed, the skids jumped out of the troughs and the Camel stalled over the bows and was run over by the lighter. Samson was lucky in that he was quickly able to disentangle himself from the wreckage and was picked up by a boat from an escorting destroyer, little the worse for his ducking.

Following the experience gained from this test, a full-size flying platform was fitted which sloped down towards the bows of the lighter at such an angle that it was horizontal when travelling at high towing speeds.

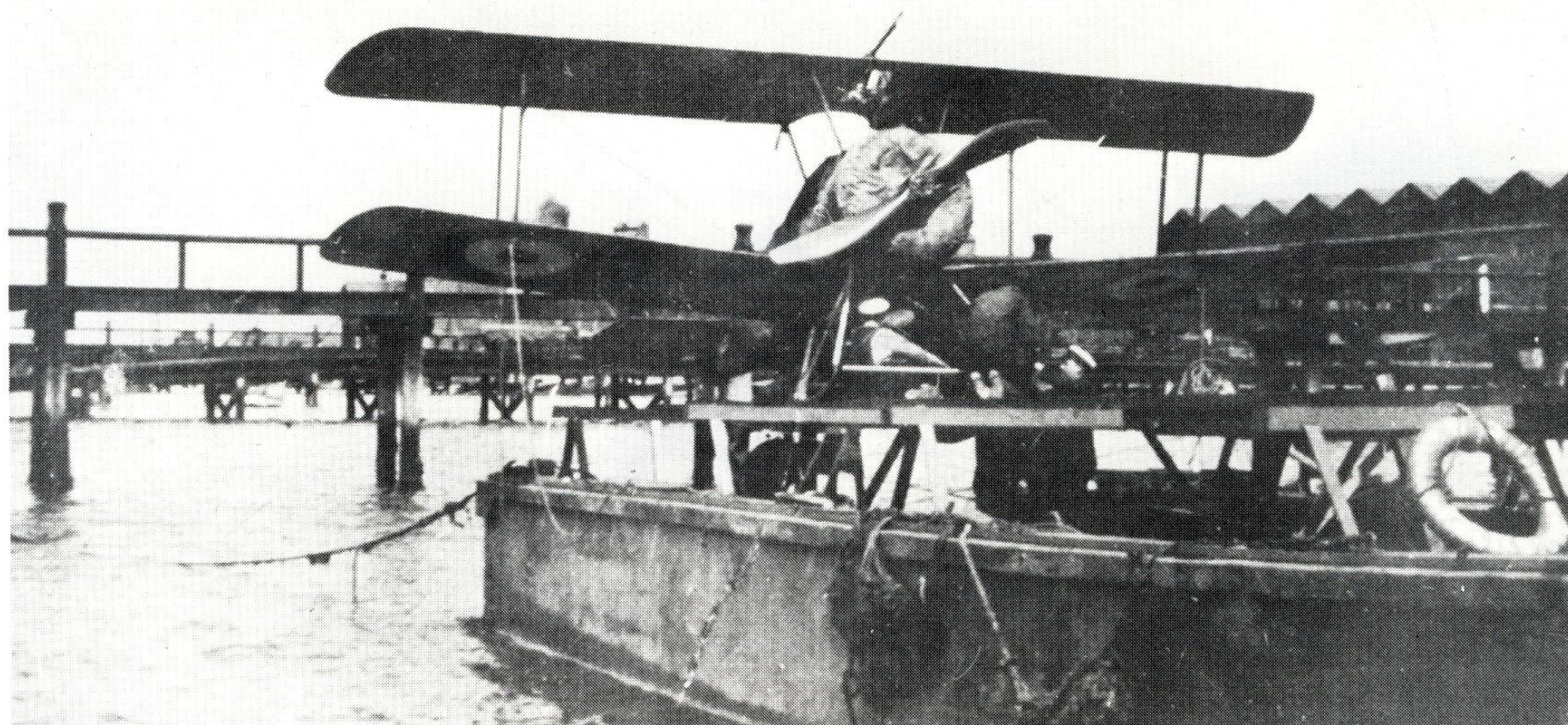
The skids and troughs were discarded and a successful normal wheeled take-off was made by Lieut S D Culley on 31 July 1918, flying Camel N6812 (Bentley BR1) from a lighter again towed by *Truculent*.

The lighter-borne Camel proved its worth on 10/11 August 1918 when a force consisting of three F2A flying



Further view of Sopwith 2F1 Camel aboard H3 lighter at Felixstowe. A fitting subject for a model diorama.

Further view of 2F1 Camel N6623 aboard Lighter H3 at Felixstowe. Note cover for engine cowling which would offer some protection during the 'approach' before the engine was switched on.



boats and one Camel (N6812) on lighters was towed by destroyers into the Heligoland Bight. They were accompanied by a strong flotilla of light cruisers and destroyers from Harwich. At first light on 11 August the force was off Terschelling, but the flying boats were unable to take off owing to the calm sea, absence of wind and their heavy load of fuel and ammunition. Very soon four German seaplanes arrived on the scene and shadowed the British force and they were later joined by the Zeppelin L53 flying at about 15000 feet. The British ships laid smoke and turned away as if to return to England. The Zeppelin followed and soon afterwards Lieut Culley took off in the Camel. Some forty minutes later, Culley had coaxed the Camel up to 19000 feet, very nearly its maximum ceiling, and then found L53 some 300 feet above him. Culley wasted no more time in attempting to get closer to his enormous target; he pulled up the Camel's nose and fired a long burst from his Vickers and Lewis guns. The Zeppelin soon caught fire and broke up, the last to be shot down in the War. The Camel landed in the sea next to the destroyer *Redoubt* and was lifted aboard its lighter.

The final operational use of lighters was on 24 October 1918 when a force of four Camels and four F2A flying boats was towed towards the German coast with the object of attacking the seaplane stations at Nordeney and Borkum. The operation was abortive as the flying boats were again found to be too heavily laden to take off and the Camels could not be flown as heavy waves had damaged their tail guide trestles.

Similar experimental operations were tried in the Adriatic in the late summer of 1917. Commodore Murray Sueter had taken over command of the RNAS in South Italy early in 1917 and had soon formulated a plan to

attack the Austrian fleet with torpedo-carrying aeroplanes. He persuaded the Admiralty to allocate a force of 12 of the new Short 320 floatplanes to Otranto and, by August 1917, the crews had been trained to fly the big machines which were equipped with the 18 inch torpedo. Unfortunately it was found that the range of the 320s, when fully laden, was only about 100 miles which was insufficient to enable them to reach the coast of Montenegro and Albania and to attack the submarine base at Cattaro and the warships in Teodo Bay. Accordingly, Sueter thought up a scheme whereby the Short 320s would be carried on wooden rafts to a take off point near to their targets. The first torpedo attack was mounted on 2 September 1917 when six Shorts were towed about 100 miles to within 60/70 miles of their targets. Unfortunately by the time the floatplanes reached their departure point a gale had blown up and the waves were too high to allow the relatively fragile machines to take off. The operation was therefore called off and on the return journey one floatplane was washed off its raft and sank and the other five were all damaged. The operation was never repeated and the Short 320s reverted to a shore-based role.

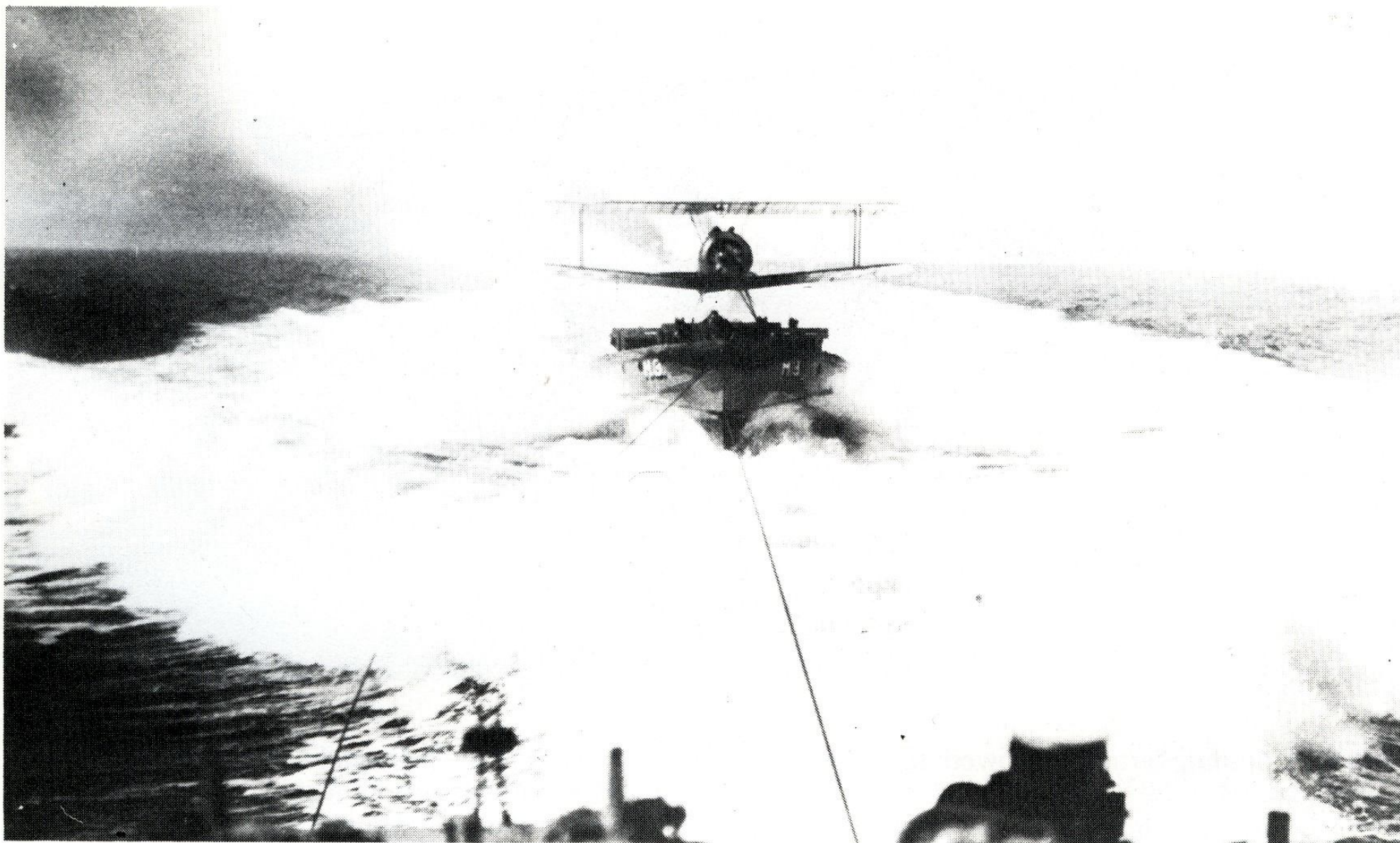
In November 1918, a proposal was put forward to launch heavily laden DH9 Day Bombers from the decks of four experimental lighters (90 feet long and 18 feet beam), if necessary by means of catapults. The increased range obtained by this means would have allowed attacks to be made on targets deeper into Germany, but the Armistice was signed before the experiments could be carried out.

Lighters built

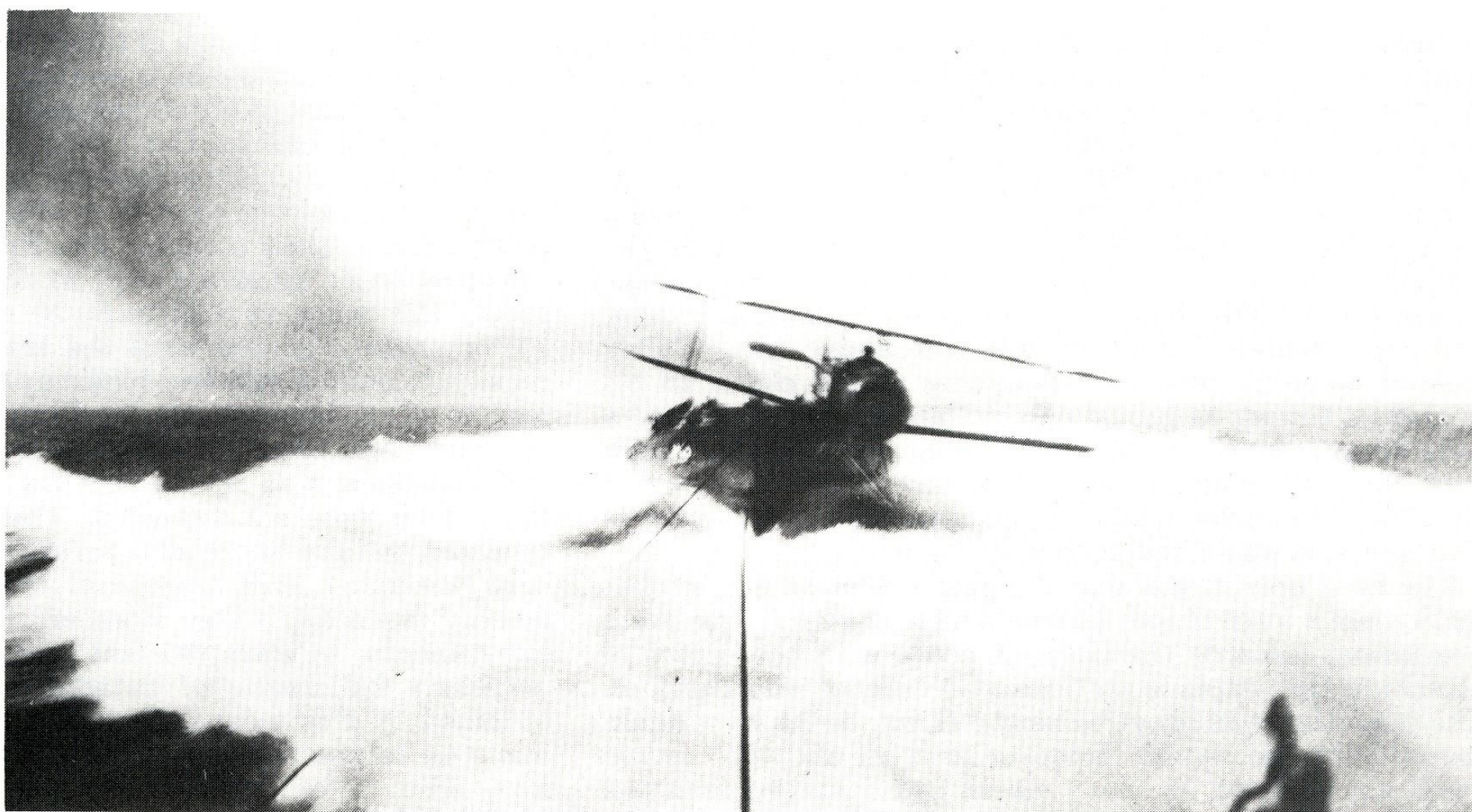
Seaplane Towing Lighters	Nos H1-H4
	Nos H5-H54 (14 cancelled)
Seaplane Docking Lighters	Nos D1-D2
	Nos D3-D14 (2 cancelled)

Towing at speed on Lighter H3 with a short tow. Lt Stuart Culley's successful attempt on 31 July 1918.

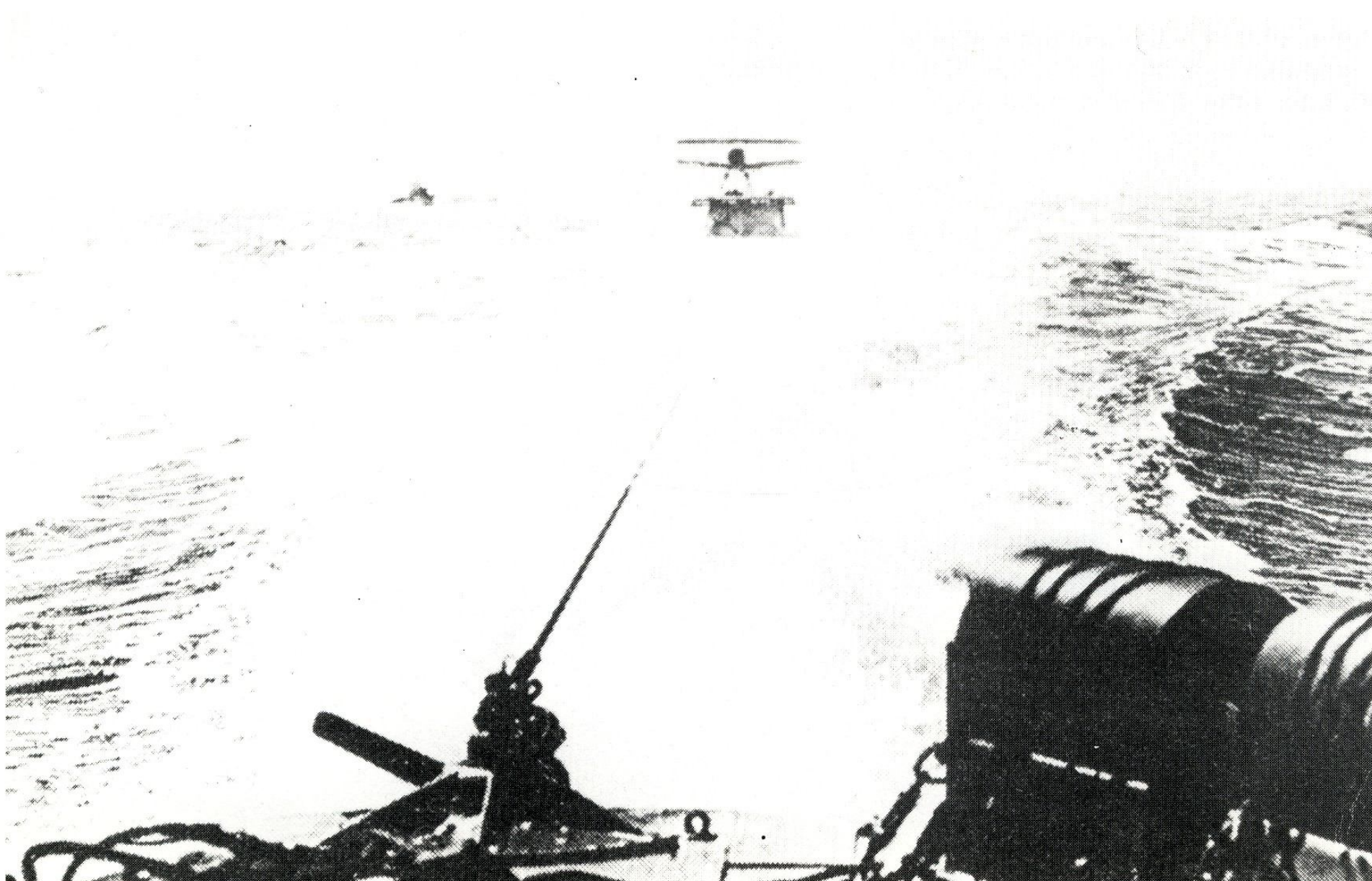




Samson's original trial flight from H3 about to take off with the lighter moving at speed and the Camel's tail up.



Samson's Camel stalling over the bows of H3 at speed, 30 May 1918.



2F1 Camel being flown off lighter H3 by Lt Stuart Culley on 31 July 1918.