Research Notes on the

de Havilland Tiger Moth

Compiled by John Griffin

Part 2/3

Version 1.0 – 29 June 2026

Scan of the original binder housed in the John Griffin Library,
1 Canadian Air Division

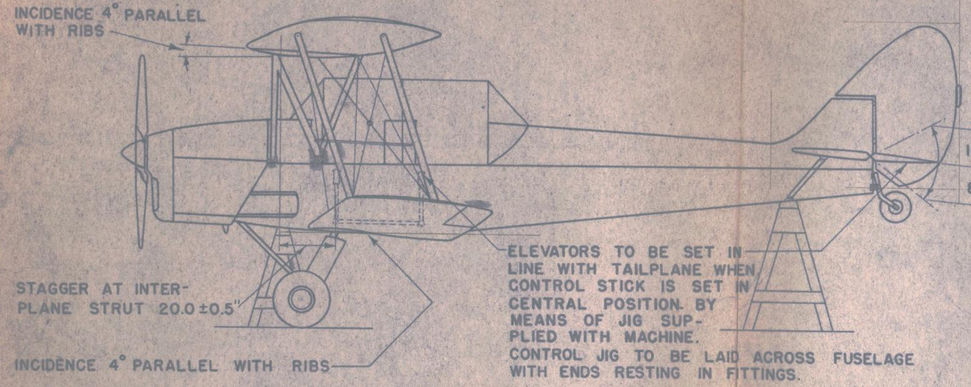
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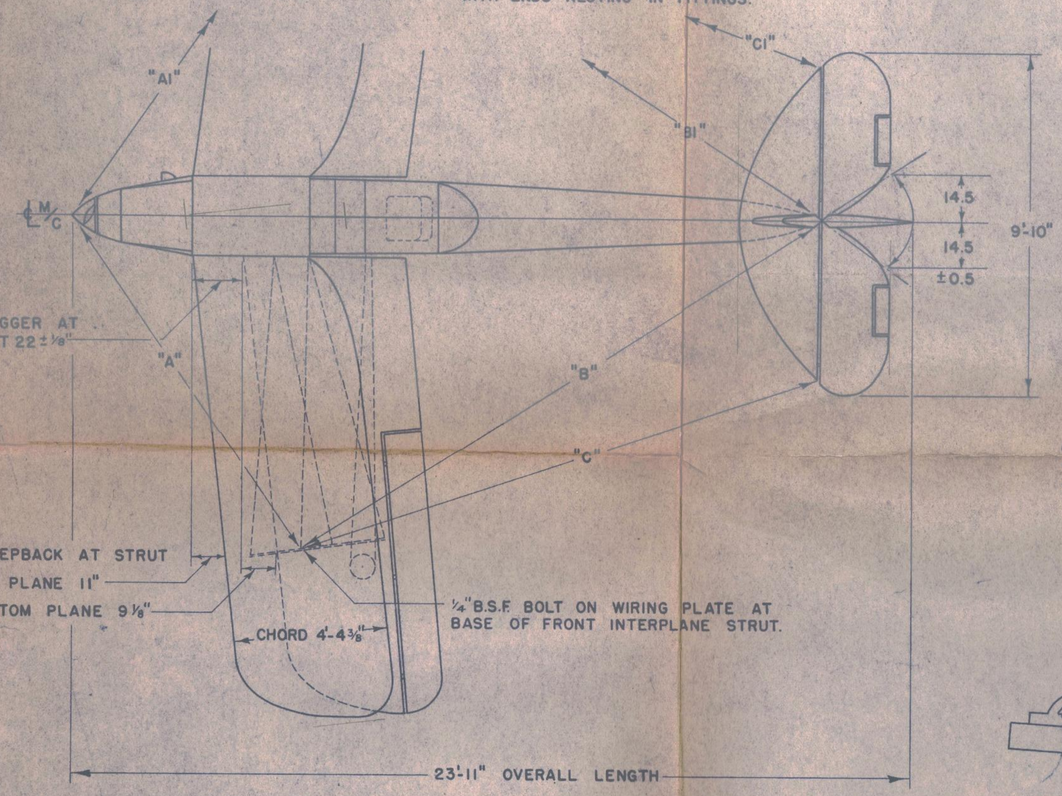
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taken June 2026

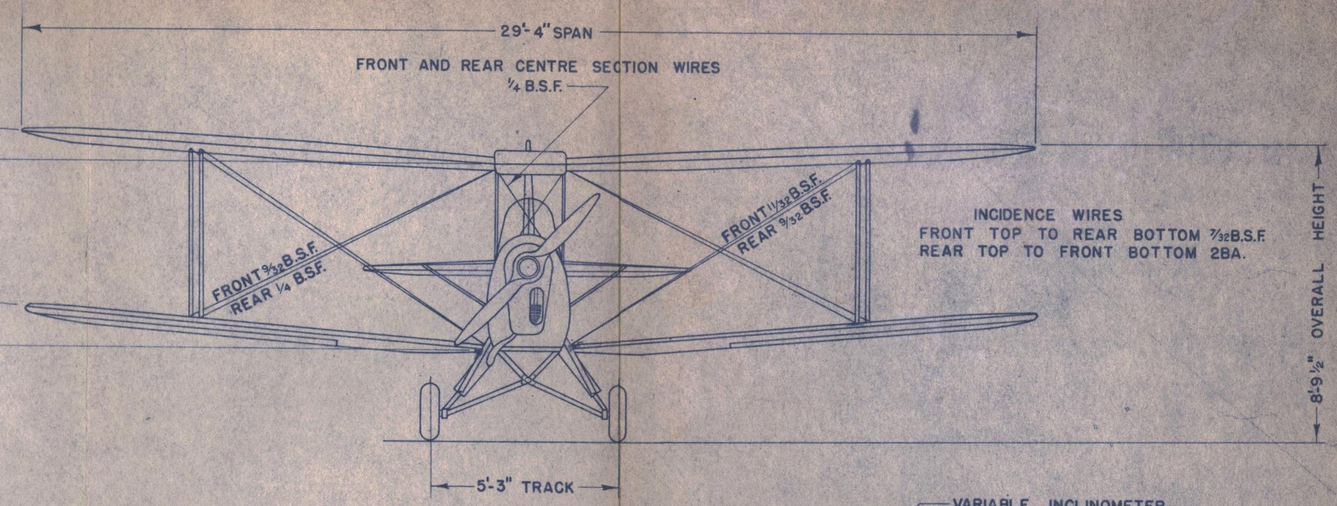
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Scale 1" = 2'-9"

LONGITUDINAL LEVEL OF FUSELAGE CHECKED BY LAYING LEVEL ON TOP LONGERON, AFTER REMOVING HALF-OVAL CAPPING ON REAR COCKPIT. LONGERONS ARE HORIZONTAL IN FLYING POSITION

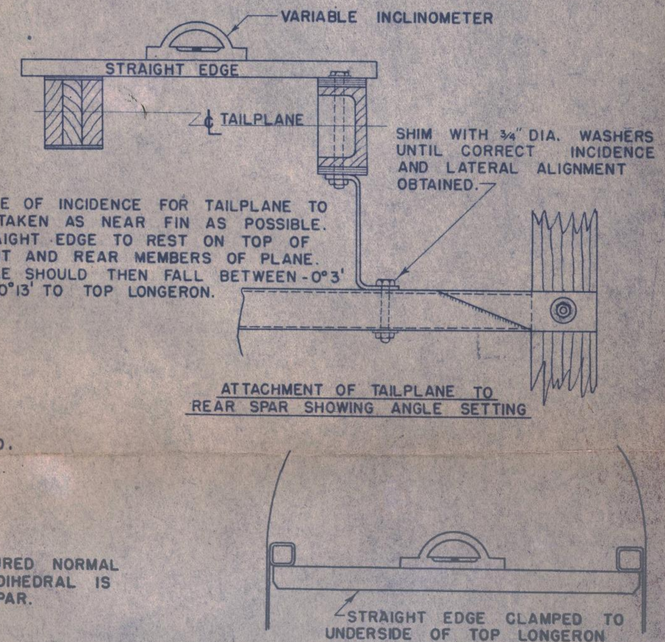






LIMITS FOR RIGGING

DIHEDRAL	±10 MIN.
INCIDENCE	±½"
STAGGER	±½" AT INTERPLANE STRUT
AILERON DROOP	¼ APPROX.
LATERAL LEVEL OF TAILPLANE	±1°
FIN POST OUT OF VERTICAL	⅛"
SWEEPBACK	±⅜" AT INTERPLANE STRUT



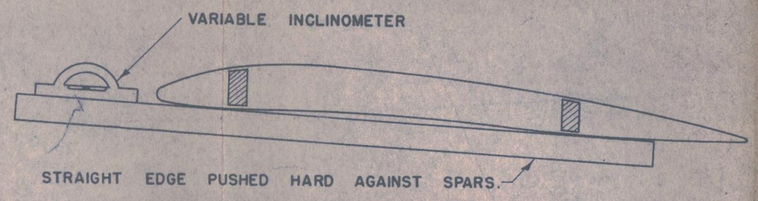
ATTACHMENT OF TAILPLANE TO REAR SPAR SHOWING ANGLE SETTING

ERECTION LIMITS OF AEROPLANE

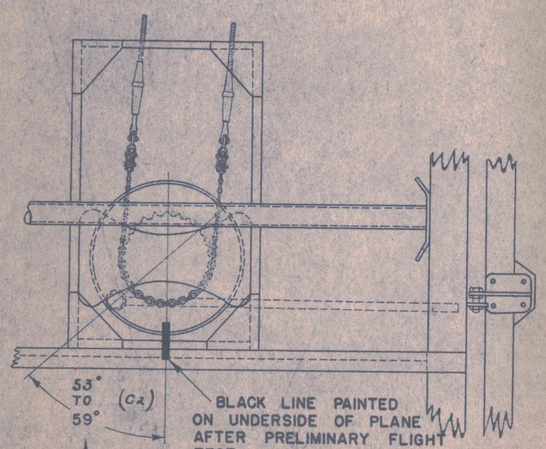
A MAXIMUM DIFFERENCE BETWEEN DIMENSIONS "A" AND "A1" OF ½" IS ALLOWED.
" " " " " "B" " "B1" " 1" " "
" " " " " "C" " "C1" " 1" " "

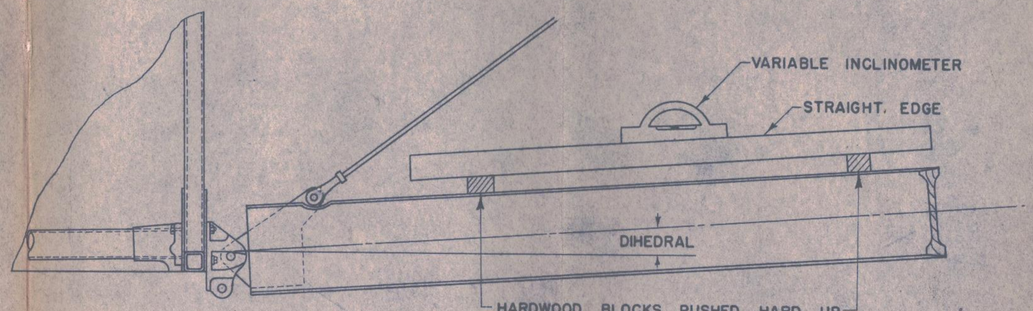
NOTE: INCIDENCE 4° IS MEASURED NORMAL TO SPAR CENTRES. DIHEDRAL IS MEASURED ALONG SPAR.

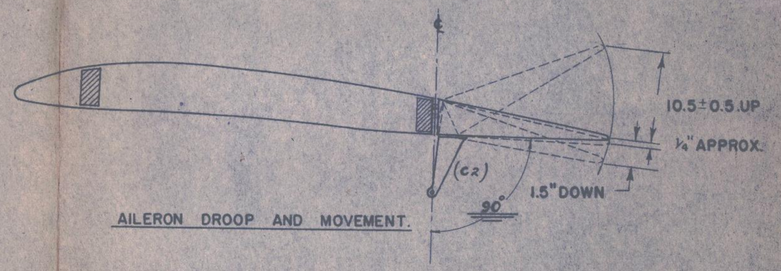
CHECKING LATERAL LEVEL OF FUSELAGE



METHOD OF MEASURING INCIDENCE

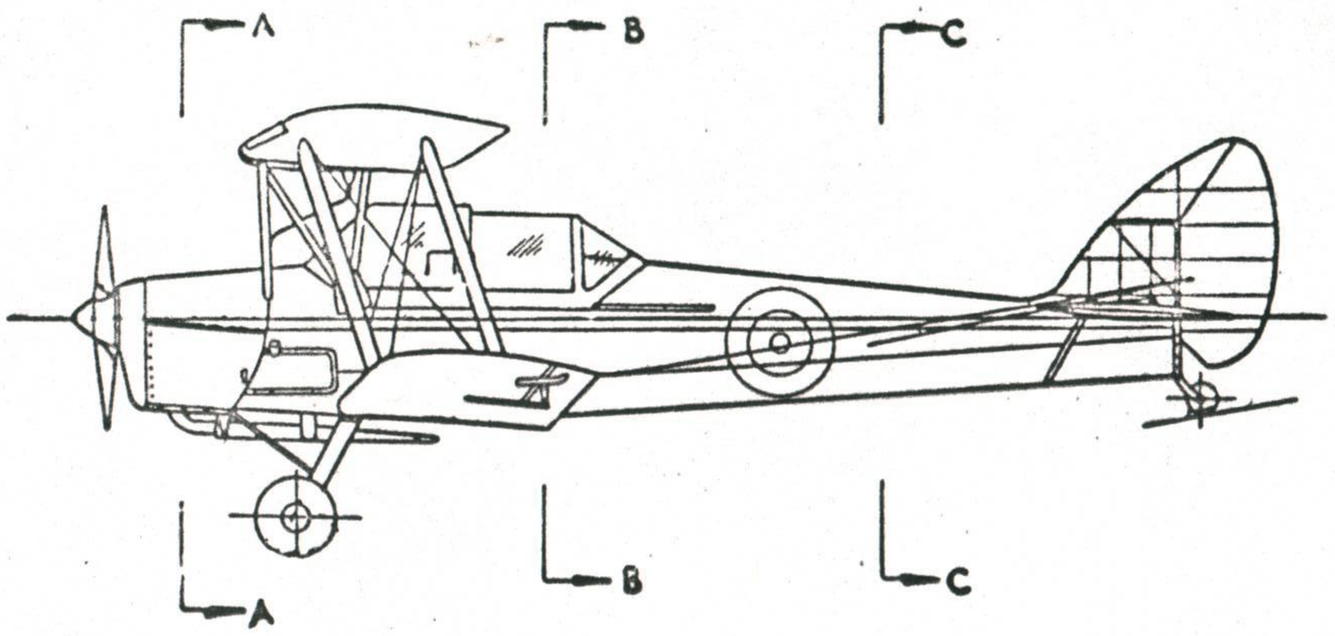


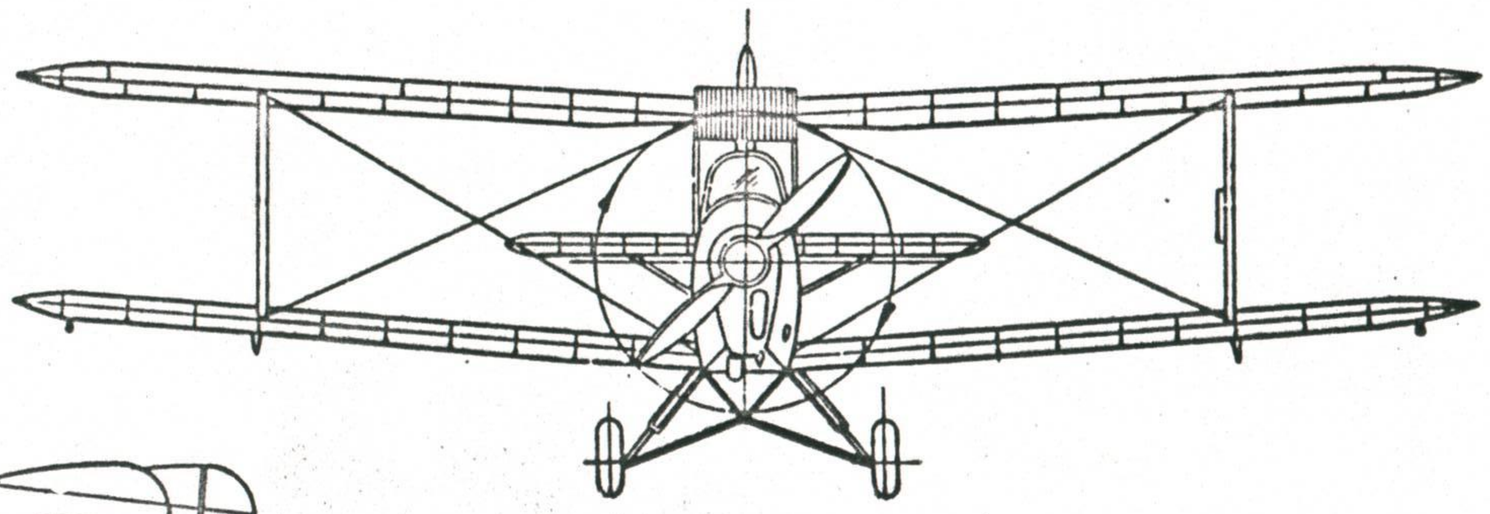


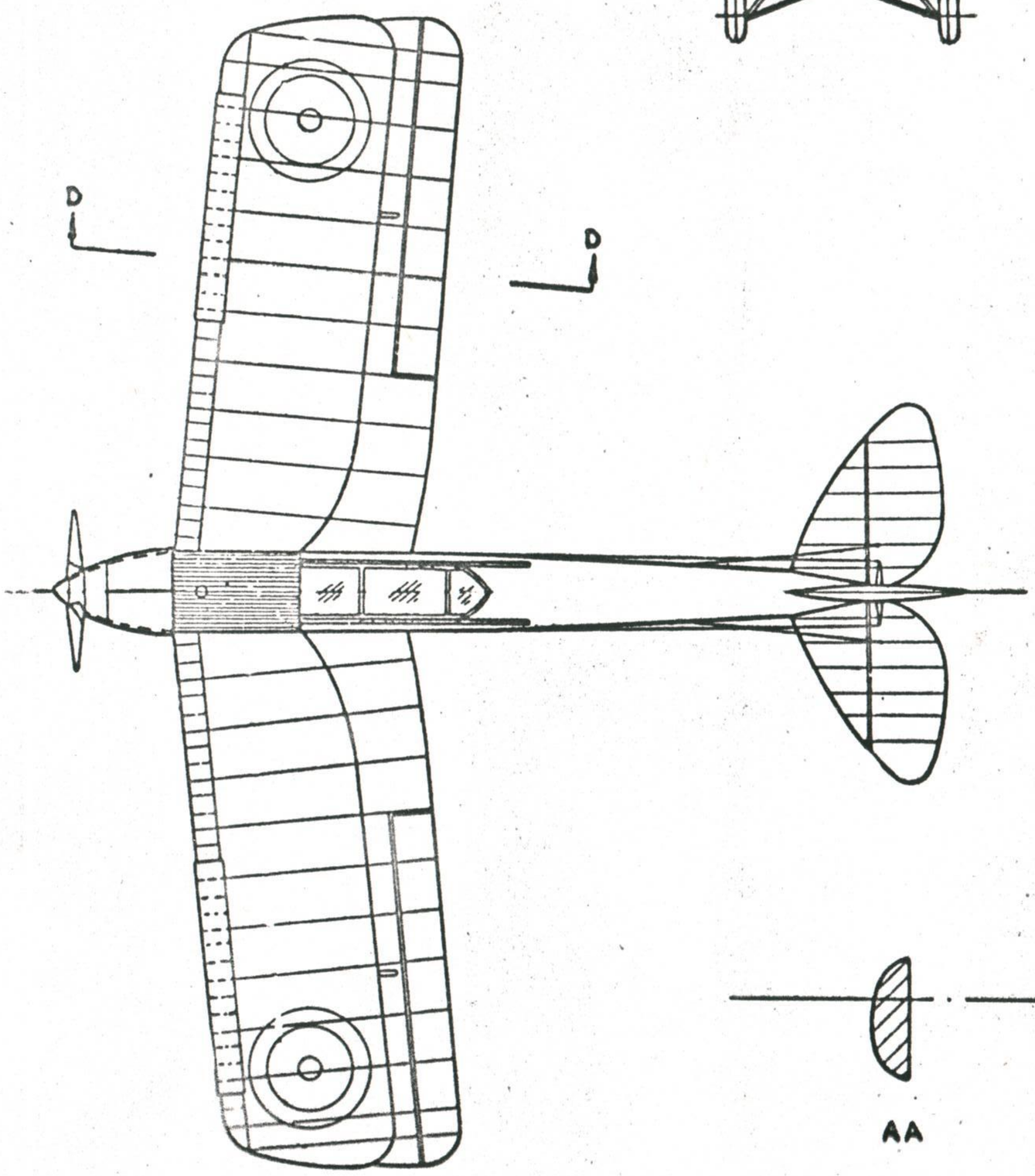


AILERON DROOP AND MOVEMENT.

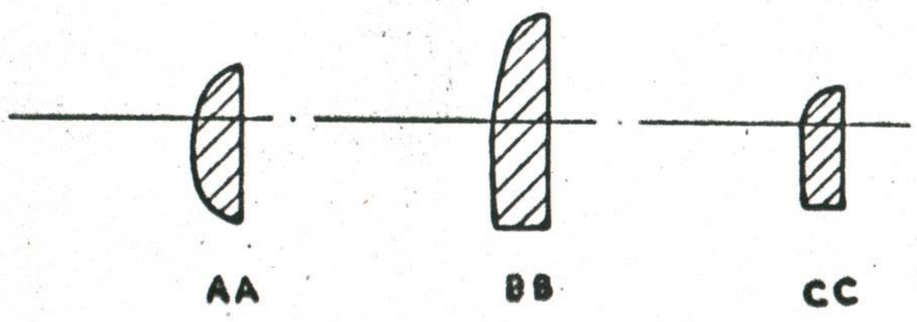
THE DE HAVILLAND AIRCRAFT CO., LTD., EDGWARE, MIDDX.							
Prod. Issue No.	11	11 C 1	11 C 2				
Mod. No	10830						
Amendmt. No	TIGER MK II/63						
Alteration Embodied		REDRAWN	53° NOW READ 53° TO 59° & AND 30° ADDED				
Date	12.4.40.	24 VI 40	20/10/41				
App. D of R		LTT. –	FNG.				
SCHED. No.							
MACHINE	DESCRIPTION						PART No.











DH 82a "TIGER MOTH"

FT.

SPECIFICATION

1. EQUIPMENT

Engine Installation

1 de Havilland Gipsy Major Series IC (high compression);
with gravity oil drain;
with dual tachometer drives (1:1 ratio);
with carburettor flooder control;
with Auto-Klean pressure oil filter.

1 Propeller 5220/G, diameter 76 inch, pitch 55 inch
or
1 Propeller 5220/SC, diameter 76 inch, pitch 53 inch.

Instruments

(Equivalent types of other makes may be used)

2 Altimeter, Kollsman 127-02
2 Compass, Kollsman 58BL
2 Airspeed indicator, Kollsman 157-06
2 Bank-and-turn indicator, Pioneer 1700-1A
2 Tachometer, Kollsman 218-011
2 Watch holder, R.C.A.F. 6A/167
2 Deviation card holder, Kollsman
1 Oil pressure gauge, Kollsman 131F-01
1 Oil temperature gauge, Kollsman 143F-01 (6 ft. capillary)
1 Venturi tube, Sperry 640600; fitted with
1 Suction relief valve, Parker R4702 FT-6D
1 Airspeed pressure head, de Havilland DHC.1934

Cockpit

2 Safety harness, R.C.A.F. 40112
1 Fire extinguisher (pressure), Pyrene 6B
1 Fire extinguisher (hand), Pyrene 1 qt.
1 Front rudder bar connecting-rod (removable)
1 Front control stick (removable)
1 Front tail-trim connecting-rod (removable)

Chassis

2 Wheel brakes, Bendix 7 x 1 1/4 mechanical.
2 Wheels (main), Dunlop 4.75-7 1/2
2 Tires (main), Dunlop 700-7 1/2
1 Wheel (tail), Otaco 1.75-4.
1 Tire (tail), Firestone 2.50-4

Miscellaneous

(Not included in empty weight)

1 Tool kit
1 Engine instruction book
1 Oil tank winter blanket
1 Nose cowl blanking disc
1 Control stick jig
1 Aircraft instruction book.

2. WEIGHTS

	Landplane	Skiplane
Empty weight	1,200 lbs.	1,255 lb.
Fuel (19 Imperial gallons)	135	135
Oil (2 Imperial gallons)	18	18
Pilot	170	170
Passenger	170	170
Parachutes	40	40
Total weight	1,733 lbs.	1,788 lbs.

Maximum permissible normal weight - 1,825 lb.
Maximum permissible acrobatic weight - 1,770 lb.

3. DIMENSIONS

Span	-	29 ft. 4 in.
Length	-	23 ft. 11 in.
Height	-	8 ft. 10 in.
Wheel track	-	5 ft. 0 in.

4. PERFORMANCE

(At 1,825 lb. weight)

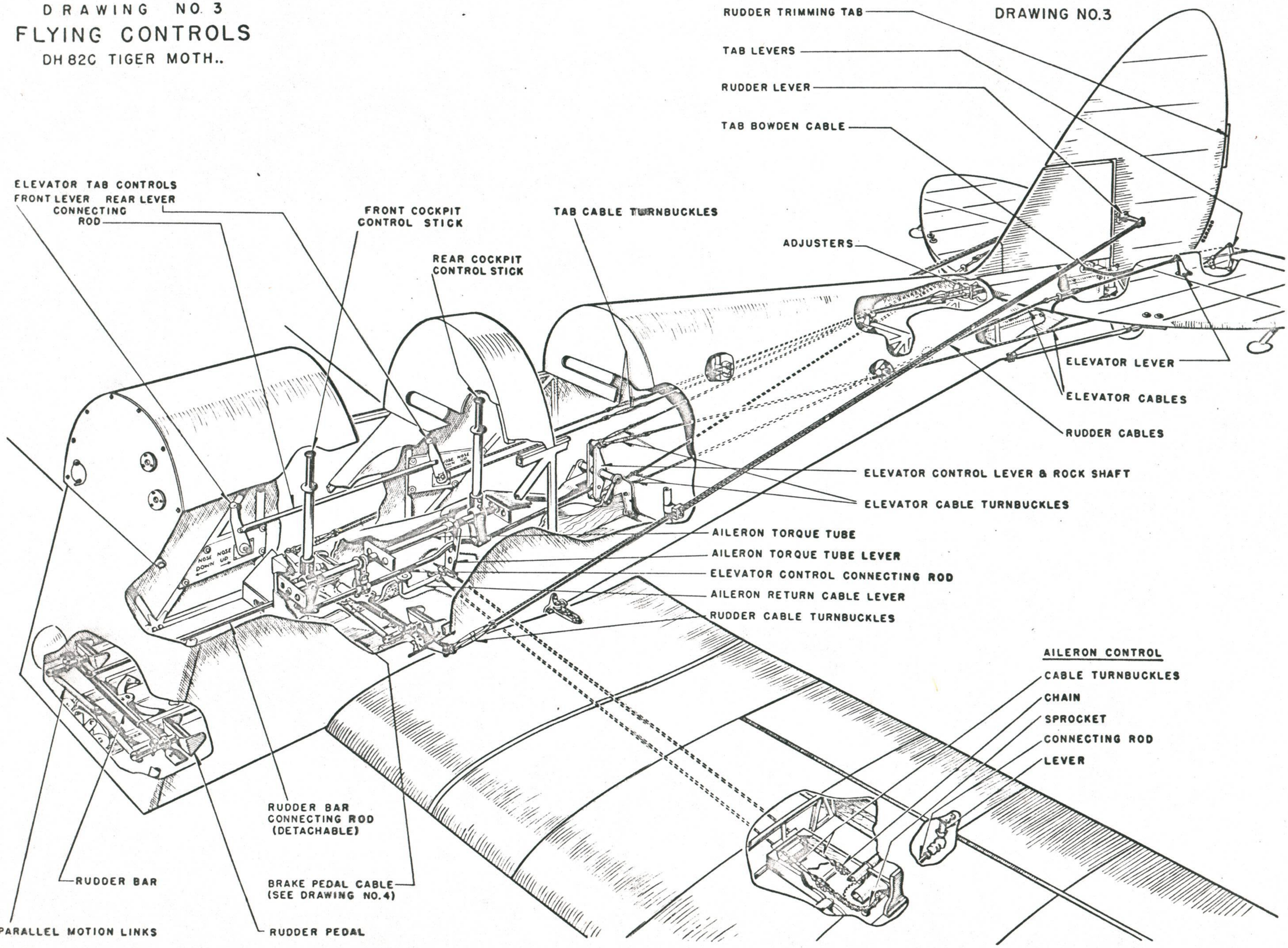
Engine power, maximum	-	136-142 h.p. at 2,400 r.p.m. (not to be used for more than 5 minutes)
Engine power, normal continuous	-	125-130 h.p. at 2,100 r.p.m.
Recommended cruising	-	85-95 h.p. at 2,050 r.p.m.
Maximum speed (140 h.p.)	-	107 m.p.h.
Cruising speed (90 h.p.)	-	90 m.p.h.
Take-off run	-	100 yards
Rate of climb (initial)	-	750 ft. per min.
Time of climb to 5,000 ft. (65 m.p.h.)	-	8.5 min.
Service ceiling	-	14,600 ft.
Absolute ceiling	-	16,500 ft.
Cruising range (90 h.p.)	-	275 miles.

ooo

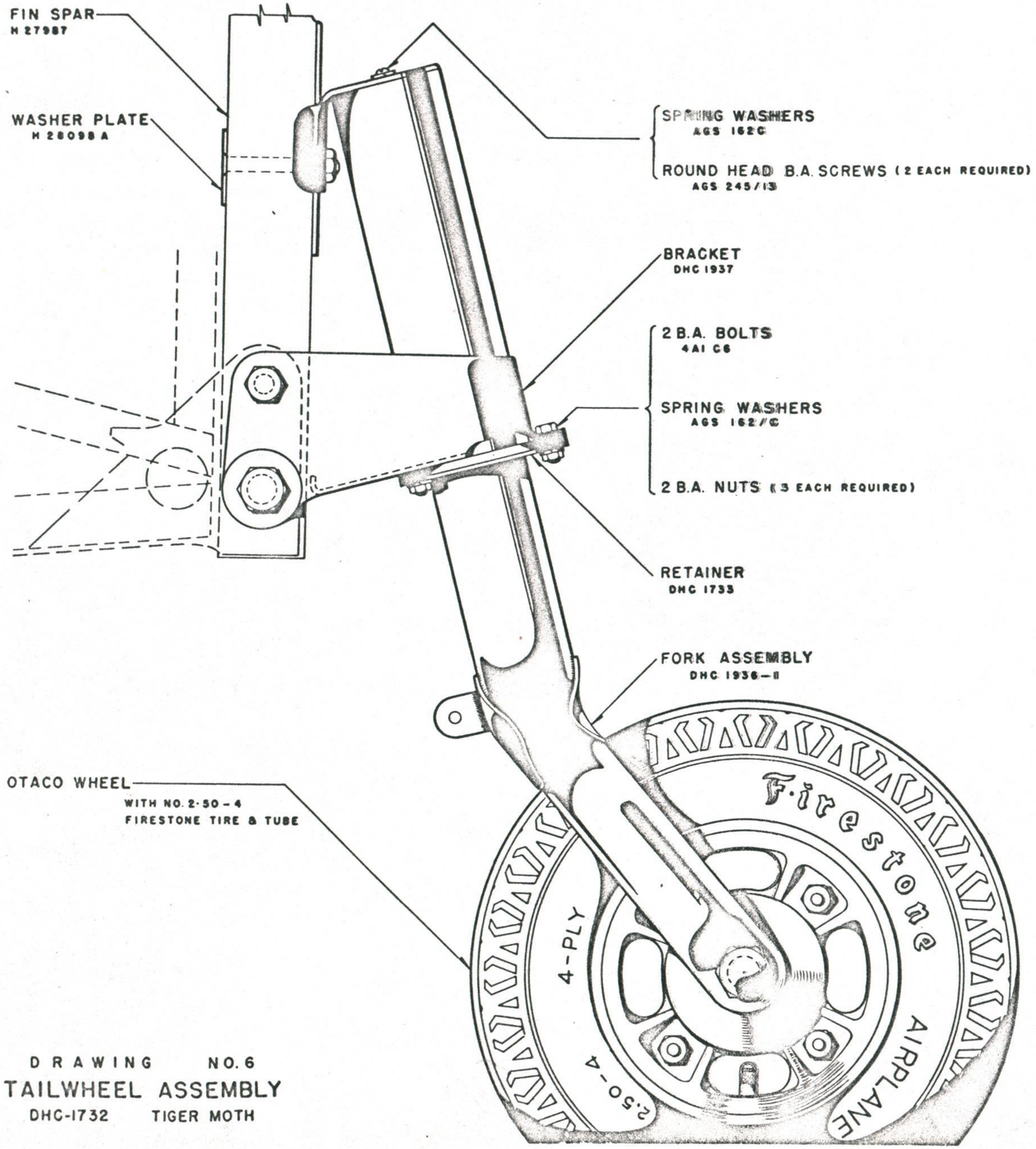
DRAWING NO. 3

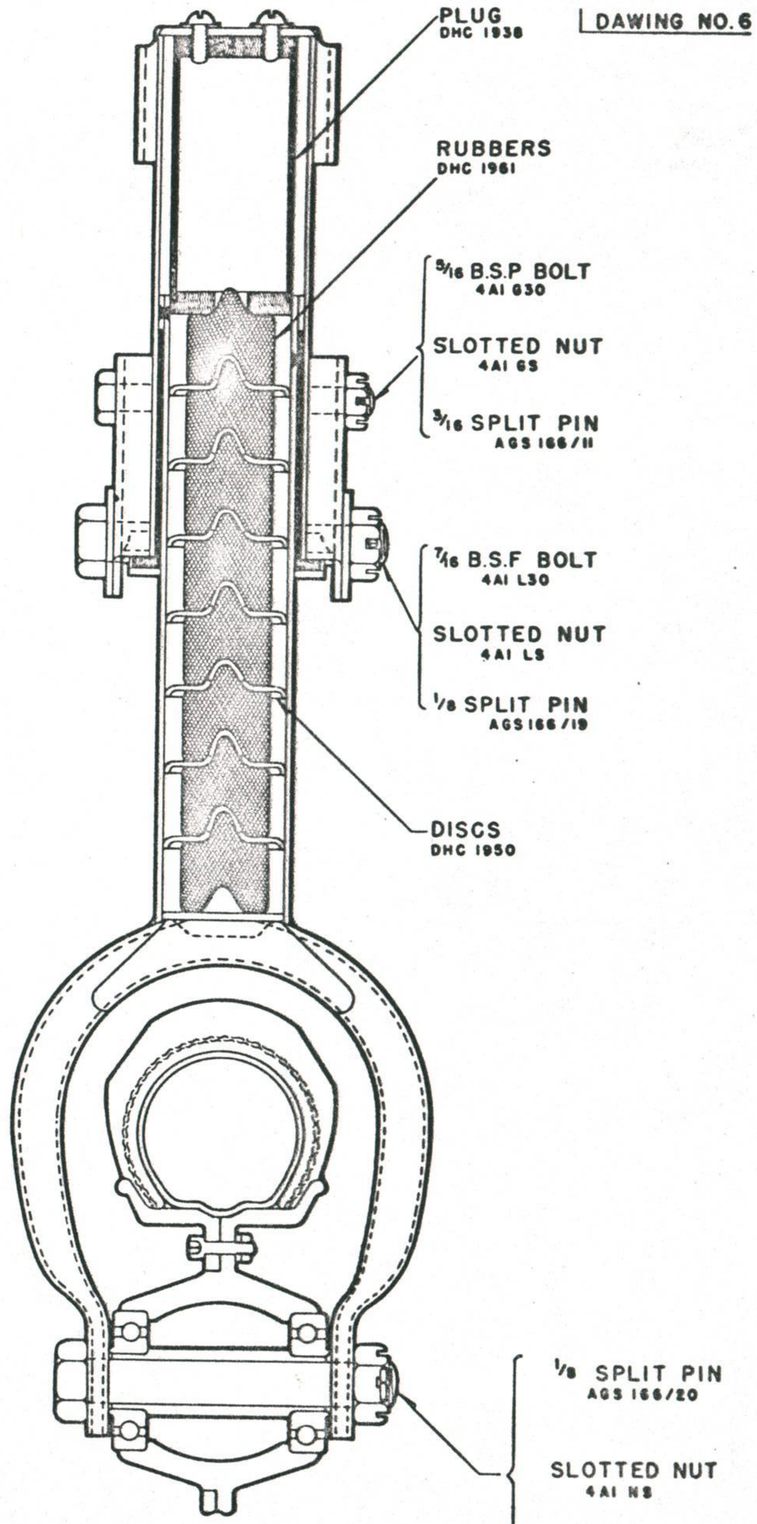
FLYING CONTROLS

DH 82C TIGER MOTH..



DRAWING NO. 6





D R A W I N G NO. 6

TAILWHEEL ASSEMBLY

DHC-1732 TIGER MOTH

SIGN POST

A MONTHLY ENQUIRY SERVICE

Each month, *Aeromodeller* and *Air-Britain* combine forces to answer interesting questions sent in by readers. Postcards, please, to "Sign Post" c/o Aeromodeller, 38 Clarendon Rd., Watford.

Tiger Colours

I am making your A.P.S. flying scale model of the 44 in. wingspan D.H.82 Tiger Moth from A.P.S. Plan FSP.555, what about some colour schemes for military Tiger Moths please?

(J.B., Birmingham.)

The long period during which Tiger Moths served with the R.A.F. saw many changes in colour schemes, and many Tiger Moths demobilised for civil use bore mute testimony to this by having considerable depths of coloured dope on their fabric ! There is some difficulty in reconciling published photographs with the evidence of the official schedule of modifications, but the main changes can be identified.

Before the war, Tiger Moths shared the standard elementary trainer colour scheme: yellow overall, with black serial numbers on fuselage and below the wings. The De Havilland factory practice of introducing a hyphen into the serial number seems to have been followed later by Morris Motors Ltd., and most Tiger Moths carried these hyphens throughout their careers, in spite of numerous repaintings.

Dark green and dark earth camouflage on the top surfaces was introduced at the outbreak of the war, and normally extended down the fuselage sides as far as the stringer about 10 in. above the lower edge. Fins and rudders were initially left yellow. Fig. 1 shows 'N6938' of 46 E. & R.F.T.S. in this colour scheme at the end of 1939.

Mod 62, first seen on T5488 in April 1940, introduced a new scheme, including the extension of the camouflage pattern to the fin and rudder. A month later, Mod. 70 introduced a yellow outer ring to the roundels, and a fin flash of equal-width red, white and blue stripes, and 'R5130' is shown in Fig. 2 in these colours in the latter part of 1940. The square gas detection panel on the top of the rear fuselage should also be noted, it was yellow-green.

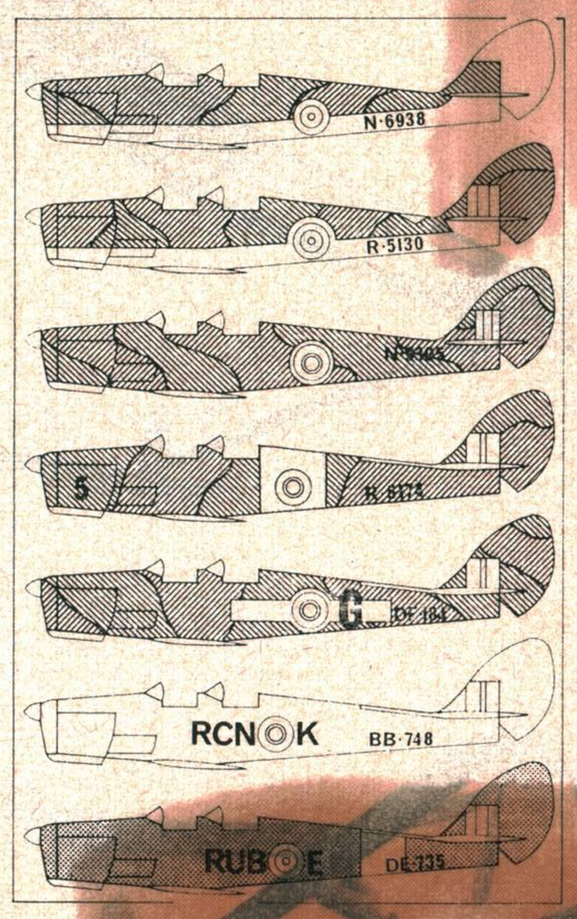
Mod. 76 was introduced in September 1940, and first applied to T7339 from the Morris production line at Cowley. The most significant change was to the roundels and fin stripes: in each case the white part was made much narrower than the red and blue. More fundamental changes were introduced by Mod. 93 in February 1941: the camouflage pattern was extended to cover the whole fuselage side, and at the same time the traditional requirement for alternate aircraft to be given right and left handed camouflage pattern on production was relaxed, doubtless at the insistence of Morris's production manager. The first machine to receive the new colours in the factory was T7867, but the extension of the camouflage pattern to cover the whole fuselage side was also carried out by R.A.F. units. Fig. 3 therefore shows 'N9505', circa 1941 with this scheme, but retaining the old equal-width fin stripes.

Camouflage patterns were of course introduced to reduce the chances of seeing the aircraft, but by the end of 1943 the risk of collisions around training aerodromes where anything up to 120 Tiger Moths might be based dictated the addition of yellow bands around the fuselage. These were normally applied vertically as shown on R5174 in Fig. 4, which has a 36 in. wide band behind the roundel, and yellow wing tips extending for 48 in. on the upper mainplanes. It also carries the individual number 5 in light blue, 12 in. high, on the engine cowling. Fig. 5 shows a variation on the theme: 'DF184' has a horizontal yellow band 18 in. by 36 in. on the fuselage side, with individual letter G in light blue outlined in black superimposed. Note also that after the end of 1941 the familiar anti-spin strakes were fitted to the rear fuselage, and the mass balance weights formerly fitted to the ailerons were removed. R5174 and DF184 both have the new pattern roundels and fin stripes.

After the war, the standard colour-scheme for Tiger Moths reverted to the pre-war all-yellow, and Fig. 6 shows 'BB748', coded RCN-K of 4 R.F.S. at Brough in August 1947. The final standard scheme was that shown in Fig. 7 (DE735, RUB-E of Birmingham University Air Squadron and Castle Bromwich in February 1949): silver overall with 18 in. wide yellow bands around the rear fuselage and the inner part of the upper wings, equal width fin stripes, and a roundel with wide white stripe and small central spot.



Three of the many different forms of colour scheme employed on Tiger Moths are shown in these photographs. Top all yellow, centre, part camouflaged, bottom totally camouflaged. Note that each possesses the unusual hyphen between the letters and numerals of the serial number.





70-32-3

DH Tiger-Moths
1938/39 Hatfield. England.



70-32-2

601 Duff Cresc.
Ottawa, Ontario
K1J 7C6
9 Oct. 1978

Dear George (Chivers)

Your Tiger Moth, 1278 was taken on charge 28 March 1942. Tiger markings varied but the following is essentially correct for the period.

The fin flash was red, white, blue with the red foward on both sides. Blue at the rudder hinge line. Each stripe is 8 inches wide and the full height of the fin. Start at the rudder side and come forward which should leave about 8 inches of yellow triangle at the nose of the fin.

The fuselage roundel ex 16" in diameter. Red radius is 1 9/16", white radius is 4 13/16", blue radius is 8" The roundel is located same place both sides of fuselage. Centre is 18 inches aft of the back end of the canopy rail and 4 3/4" above the first stringer from the bottom of the fuselage.

The fuselage serial is made up of the four numerals. 8" high, 5" wide and with a stroke 1" thick. A space of 2 inches between numbers. Locate the serial block on the thrust line. The aft end of the block ex 1" ahead of a vertical line dropped to the stabilizer bracing strut where it attaches to the fuselage

and the bottoms of the aft runner is 4" above the bottom longeron.

The wing rondel on the bottom on the lower wing is 32 inch diameter. The red radius is 6 1/4 inches, the white radius is 9 5/8 inches and the blue is 16 inches. The rondel must be laid out such that the rear edge is 2 inches from the aileron line and inboard from the tip to allow 2 inches of clearance from the hand hold slot. When you find the demensions to locate the centre of the rondel, the rondel on the upper surface of the top wing is located in the same place. Rondels same in all four locations.

The serial number is applied to the lower surface of the bottom wing repeated on right and left — reading from tip to root. The serial number block is located centrally between the wing root and the inside edge of the rondel. The top & bottom of the numbers is located on the chord line with an equal space at the leading edge and between the bottom of the numbers and the aileron line. Regulation numbers are 26 inches high 16 1/4 wide and with a stroke 3 1/4 wide. Space between numbers 4 inches.

M.O.T wont let you put the serial on the under surface so you will have to use the civil registration there to their regulations.

All serials are black. All struts are gloss black. The engine cowl is gloss black. The back surface of the plop. was flat black. Canopy metal work, unpainted aluminium.

If you have trouble drop me a line. Good luck.

Regards.

J.A. Griffin

Blue 1-GP-12-4 Blue
0 white
57 Red
56 yellow
Tiger Moth - 40635

June '65

Note Grey 20

Wing Roundel diameter - located 2" from Tip & Aileron
in 1/5ths. 1"

Fin stripe widths

Wing markers

~~Superseded~~ located equadistant (central) from the fuselage
at wing root & the inside edge of the roundel
Letters 2" from leading edge
32" high, 20" wide & 4" stroke

Wing letters

8/24
½ chord high 16¼ 5 3¼ (chord 4'4 3/8"
width 5/8 x ½ chord 52 3/8" / 2 = 26 3/16
Stroke ⅛ x ½ chord

Located central between roundel & root
& central between leading edge & Aileron
reading Tip to root i.e. Top to
leading edge below right wing.

Fuselage serial 8" high, 5" wide 1" Stroke
space 2½"

Fuselage Roa

Tiger Moth

Roundels.

Tiger		Diameter		
Fuselage	small	red 6	3⅛	
	new	white 8	9⅝	
	narrow	blue 16	16 ✓	
Wings	medium	red 12		11
	new	white 16	or	15
		blue 32 ✓		30

} for decals.

16 / 9⅜ / 6⅝ / 3 5/16

6½ / 3⅛

9⅝ / 6⅜ / 15⅞ / 16 / 3 3/16 / 5 / 14 / 9¾ / 6½ / 16¼

18 10/8 / 19⅞ ¼

3⅜ / 3

letters with the 32" roundel.

chord 52 3/8 ÷ 2 = 26 3/16

Fuselage Roundel 16"

located with centre 18" aft of the aft end of the canopy rails and 4¾" above the second longeron from the bottom

@ 4¾"

Red radius 1½" 1 9/16

White radius 4¾" 3 4/16 + 1 9/16 4 13/16

Blue radius 8" @ 26/16 10/16 5

Fuselage serial

located just ahead of the stab bracing strut attachment point and bottom on the thrust line 4" above the bottom longeron.

fin stripes

Red leading both sides, blue at the rudder hinge. Each strip is full height of fin and 8" wide. start at aft end and move forward which leaves about 7 to 8" of yellow at the leading edge → 8 ←

Wing Roundel 32"

~~32~~"

Red radius 6 1/4
White radius 19 1/4
Blue radius 32"

Lower surface lower wing
located with 2" clearance of aileron line and 2" clearance of handhold slot
Find centre and transfer to upper surface of top wing. ~~Both~~ All four roundels located in same place.

The Tiger Moth

BY JIM BRIGANCE



This is, without doubt, the most beautiful Tiger Moth in the United States, if not the world. It's the result of years of toil and hardship on the part of Air Force Colonel Harry Williams of San Antonio, Texas.

Color photographs by Greer Cavagnaro

San Antonio is the cradle of American military aviation. Ever since Ben Foulois made the first military flight at Ft. Sam Houston, the stars over the Alamo have been laced together by nearly every kind of airplane known to man.

Perhaps it's for that reason that San Antonians have come to be somewhat blasé about flying. But even air-jaded old-timers curled up their toes when Air Force Col. Harry Williams and I landed at San Antonio International Airport in a camouflaged 1931 de Havilland Tiger Moth.

Harry is assigned to Randolph Air Force Base and is the owner of one of only 17 FAA-registered Tiger Moths in the United States. His Moth has the added distinction of being the only Australian one in America with an original standard normal category type certificate.

Before arriving at San Antonio International, Harry and I had made the necessary arrangements with the FAA and airport director. Operating from a plowed corn field, we strapped the Moth to our hindsides and prepared for takeoff. This required nothing more complicated than prop-

continued on page 70

The Tiger Moth















BY DONALD G. TYPOND

Reading: The Big Picture



Once a year the aluminum birds migrate to southeastern Pennsylvania, the older ones freshly preened and the fledgelings proudly on display. It's an ornithological field day, unmatched by any other show in the country, and if you dig airplanes, it's definitely the place to be.

Reading tower, Cherokee six four five three Julie, 10 east with the numbers."

"Five three Julie, Reading tower. Remain outside the airport area for 15 minutes, we will call you in sequence."

Forty-six minutes later: "Five three Julie, enter right downwind."

"Five three Julie downwind."

"Five three Julie, you are seven behind the King Air. Gulfstream jet, you are eight behind the Cherokee."

And so you arrive at the Reading Air Show. The question is, just what are you, a little fly-for-fun airplane owner, doing here in the big leagues when it would be easier to spend the day at the beach? Why play dodge-em with million-dollar bizjets if all you have is a single navcom and a flat wallet?

Frankly, if you're perfectly content with what you own, or rent, and have no interest at all in what's going on in the general aviation industry—in short, if you aren't an airplane nut—then stay away from Reading.

Or, on the other hand, if you're the type who gets all bitter and frustrated when you're exposed to things that you want and will probably never have,

Confederate *continued from page 66*

Texas, " . . . in memory of the men who flew these great aircraft."

Early Sunday morning, John Trainor, who captains a TWA 727 when he's not flying his AT-6 or the CAF's P-51, briefs the pilots who are to fly in the T-6 race. Rolled out on the flight line, the Flying Museum's planes represent the most complete collection of flyable WW-2 aircraft assembled on one field in many years. To the delight of the crowd, the planes don't sit for long. First into the air, for a little preshow workout, are two P-38 Lightnings piloted by Tony LeVier and Lefty Gardner. It has always been my impression that the prettiest sound going was a P-38 running up its twin Allisons, but I was wrong. You ain't heard nothin' yet until you hear two P-38s running up their four Allisons.

The first event on the program, the T-6 race, proves to be a rousing, roaring crowd-pleaser with Col. Bill Turnbull winning. Throughout the rest of the day, the fighters, one after another, take to the air and show their stuff: Mike Rettke's FM-2 Wildcat in authentic camouflage, then two F8F Bearcats and a P-63 King Cobra. A pair of P-51 Mustangs fly formation with an F6F Hellcat, while the P-38s come howling by, low and fast. The Corsair is grounded with a hydraulic problem and the Thunderbolt is out of license, but the Curtiss P-40 Warhawk roars down the runway, lifts crisply into the air, and climbs upward at an astonishing rate. Most unique of the planes that fly are the Spitfire Mark IV, the Messerschmitt Me 109, and the North American P-82 Twin Mustang.

. . . What was that you said, Lloyd? Would I like to take the 51 around the pattern? Does a radial engine leak oil? Certainly I would.

It's a day filled with the spectacular. Where else could you see, now or ever, two Lightnings, a Spitfire, and a Messerschmitt fly in formation? Or a P-38 chasing an Me 109? The flybys are handled with skill and professional restraint with the only aerobatics being done by Lefty Gardner in the P-38. None of the crass cutting, low rolls one often sees in such a show, though—only smooth, graceful Cuban eights, loops, and slow rolls at an altitude comfortable to both pilot and crowd alike.

On this Sunday we saw more flying of the historic, high-performance birds than one could anywhere outside of the Reno Air Races. In years to come, I expect to see the CAF Annual Seminar become the biggest, hottest fly-in air show for this segment of sport aviation.

Making It *continued from page 47*

willing to work 14 and 15 hours a day to stay in business. The only time he refused to work was Sunday mornings. Come charter or calamity, the whole Ingram family went to church.

The rest of the time his petite, pretty wife Marilyn held down the office while "Ink," as she calls him, went scouting for customers. It was the start of a 6½-year career keeping house for a husband and two growing boys, gassing and manhandling airplanes, and booking charters, students, and rentals.

It was a long time before she learned how close to disaster they came. She hadn't minded the move to a strange community, and because she knew even less about general aviation than Ink, she was undisturbed about the new business.

"I didn't worry about it. I had every confidence in him. It worries me much more now, looking back on it. I believed everything everybody told me."

One thing her husband didn't tell her was the amount of red ink in the books he juggled nightly. Today he grins and says that he saw no point in worrying her.

"There were no books for the first few months because there weren't any customers," she says now, long after being promoted to bookkeeper. "But in September, he said, 'I don't think we're gonna make it.' We had to borrow money to buy a load of gas. We had shot our little wad." The money came from another pilot on the field. "We have a fabulous credit rating now, but at that time we had none."

Ingram never lost faith. "It was such a sick cat that it couldn't help but get well.

"My first goal was selling charter business. So I just put on my old hat and went around to all the businesses and corporations I could think of that could use my service. Some of 'em looked down their noses, but some figured if I were bold enough to beard 'em, they'd be bold enough to try."

He covered a 25-mile radius and soon came up with three steady corporate customers. Within months, other firms, who had said not long ago that they never needed charter services, were calling Carthage Airways. The first student signed up—a marble estimator named Jack Kreighbaum. Ingram had gained his first tiny foothold.

By March, 1965, he hired his first full-time pilot. By that time, sons Mark, then 16, and Chris, 13, both were working too, as line boys and office help. During summer vacations, their hours were almost as long as their parents'.

Mark started taking flying lessons from his dad. He got his student ticket on his 16th birthday, his private license on his 17th birthday, his commercial a year later. Now 19 and carrying instructor and multi-engine ratings, he flew nearly 400 hours in the last year working part-time and finished his second semester of college this spring. He will earn his instrument license this summer "if I have to stand him up against a wall and shoot it into him," says his dad.

Chris, following the same path, soloed five airplanes this year on his 16th birthday, ranging from an initial flight in a U-206 down to a 150.

The business suddenly began to boom, Ingram became in succession an instrument instructor, a flight examiner, an instrument examiner, and a multi-engine pilot.

"I didn't attempt a twin until 1966," he says, aware of the high cost of such planes. "It takes about $3,600 a month just to put one out there on the ramp.'"

It paid off, however, since many firms insist their senior officers ride only in multi-engine aircraft. His first twin, a 320 Skyknight, flew 600 hours last year. A back-up 310, inherited in the February purchase of a second fixed base operation at Miami, Oklahoma, is flying 50 hours a month. In mid-June, Ingram put a new 337 Skymaster on the line. He expects it to fly 300 hours the first year, 600 the second.

Today, Carthage Airways' home operation includes three 150s, a 172, two 182s, a U-206, and the two twins. Eight planes came with the Miami purchase, including the used 310, which was transferred to Carthage for want of a qualified pilot in Miami to fly it. Remaining there are two 150s, three 172s, a 177, and a 182.

Jack Kreighbaum, his first student, tossed over more than a dozen years' seniority on his industrial job and joined what is now Carthage Airways, Inc., becoming manager at Miami.

Last November, Ingram added a sales branch, bringing in Jack Hartin, an experienced Midwestern aircraft salesman, as vice-president. Hartin promptly sold a 421A and a 401 to a Lebanon, Montana, natural gas company, indirectly creating a shock for a Carthage banker in the process. Ingram called the bank and told them he needed to borrow some short-term money to install the avionics in the newly sold planes, pending payment from the buyer. Fine, said the banker, how much would he need?/*continued on page 70*

Making It *continued from page 69*

"Oh, I think about a quarter of a million," said Ingram, well aware that few townspeople had any idea what had been happening at their sleepy little airport.

"How much?" demanded the banker.

"A quarter million," repeated Ingram.

There was a long, pregnant pause. Finally the banker said, "Well. Well, I—think we can handle that."

It was a long way from 1962.

He estimates his equity now in the two operations at about $100,000, and notes, "I would've sold her for less, some days."

"Yes, sometimes we'd've given it away," says Marilyn. In fact, in the early days, they did offer more than once to give it back to the original lessee. The offer was firmly refused.

"I'm surprised at the growth that it has shown, really," says Ingram. "If you'd told me five years ago that we'd be doing the multi-engine charter work that we're doing, I would have said you were silly.

"We did in about one and a half or two years what most people get done in five," he concedes. "But you see I had no other choice. I had to do it within that time or fold."

By contrast, current fleet utilization includes 4,000 hours instruction annually, 800 hours multi-engine charter, 1,500 hours single-engine charter, and 750 hours rental.

"The one reason for our success is that we've kept new equipment on the line. We're operating with practically all current-year equipment." He has 21 planes operational now, including three leased to a Mexico, Montana, FBO and one to a Lebanon FBO, plus one on lease/purchase in Carthage. Four others, held principally for sale. are used for backup. One, a spanking new 402, is not. "We need to maintain a stable fleet of about 20 airplanes."

The VA-approved Carthage and Miami flight schools offer private, commercial, instructor, instrument, and multi-engine courses and soon will add ATR training. In addition, the Miami operation offers a single-engine seaplane rating through an affiliate.

Today, spreading out in virtually all directions, Ingram sees no end in sight. "We certainly look for continued growth in the use of an airplane as means of transportation. Within the next five years, I expect to be flying charter in the Fanjet 500."

"He intends to make enough money so he can hire a top-notch bookkeeper," interjects Marilyn, who detests the job.

"And so I can retire and only fly about 100 hours a year," adds the company president, who's still working 12 hours a day and flying 1,000 hours a year.

But they both say they'd do it again.

Tiger Moth *continued from page 39*

ping the engine, checking the oil pressure, and saying a brief prayer.

"You're really going through with this," I said. Harry climbed in behind me.

"Sure, you know how slow mail service is around here."

Our mission was to deliver a letter to the Aviation Historical Society of Australia. Text of the letter concerned Harry's Moth, which was in and out of the airline service twice.

As the Moth rumbled over the clods, I kept thinking this had all the earmarkings of insanity. No radio, both of us dressed like something from the Argonne Forest, attempting to land at a metropolitan airport.

The Moth was impatient. All 135 horses harnessed in the Gipsy engine were pawing at the ground. A brilliant sun made a natural mirror of the windscreen. I caught a glimpse of us—goggles in place, silk scarves flapping in the propwash. An open cockpit carved into a camouflaged biplane is heady stuff for any pilot.

The Moth growled and suddenly we were airborne, leaping off the ground in a tight 60-degree turn and heading north. The engine hummed like a woman in the kitchen; the stick was a magic wand. In all of man's arsenal of inventiveness, he has devised nothing to compete with the thrill of a biplane on a clear day.

Out on the wings, the RAF roundels seemed to swirl around and around until we no longer were over South Texas but the South of France at another time. A Piper Aztec zipped across beneath us from 10 o'clock, arched over in a steep turn, and passed by again in obvious disbelief. But I believed it. He was a Fokker. And this was war!

Moments later, a Cessna 150 shot across in front and below us. Harry turned, an evil curl to his lips. The chase was on. The 150 got down on the deck, skimming across the treetops like a gopher looking for a hole. We followed him down, lining up imaginary gunsights.

Entering the traffic pattern at International Airport, we rubbernecked for any kind of traffic. In a Moth, even house flys are considered "bogies."

The tower flashed us a green light; we touched down quickly and taxied toward the Eastern Airlines gate section. Ground crewmen were already racing across the hardstand with much the same expression GIs must have had at Pearl Harbor.

Parked beneath the awninglike wings of an Eastern 707, I unsnapped my chin strap and turned around. At last Harry and I could communicate without hand signals.

"We made it," Harry laughed. "We really made it."

Hundreds of waiting passengers had by this time braved the chill to step outside for a closer look. Others, their noses smeared against the terminal windows, stared in quiet awe.

"What the hell is this?" shouted a ground crewman, lugging a pair of wheel chocks toward us. At least they weren't going to be hostile to "Twilight Zone" visitors.

We were surrounded by Eastern flight personnel.

"Have you got a screw loose? Whose plane—how the—?"

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We were unbuckling seat belts when I looked up into the face of J. B. Thompson, captain of the 707.

"Very funny," he said dryly. "Whose plane is this?"

"Mine," Harry said, very casually. Too casually. "I want you to mail a letter for me."

Thompson flushed and stepped back. The stewardesses were already loading passengers. He couldn't have been more shocked than if the gear on his 707 had just buckled and collapsed.

"You want me to *what*?"

"Come on, mail this letter, will ya?"

Confused, Thompson accepted the parcel, wheeled and walked away. Suddenly, he halted, came back and a big open grin played across his face.

"You must be kidding," he said shaking his head. "I mean you must be some kind of nut—how—."

Harry Williams is no nut. Of course, he was nutty enough to love flying B-17s over Europe during World War Two and later became "insane" enough to drive B-29s over Korea, but other than that he's just a guy who loves flying more than eating. When Harry turned 45, the Air Force took his parachute and shoved a pencil in his mitt. But he got revenge!

"I've always loved the Tiger Moth," Harry explains. "I fooled around with them a little in England during the war, and I promised myself that one day I would own one."

The Tiger Moth can be traced to the late Sir Geoffrey de Havilland and his unhappy experience in building two light airplanes.

The first one he built was a DH 53 in 1923. The offspring was a DH 51, which still just didn't cut the mustard.

De Havilland refined the better points of both planes, and in 1928 came out with his DH 60M, loosely referred to as the Metal Moth. It was powered by either the 100-hp Gipsy I engine or the 120-hp Gipsy II.

The trainer version, the DH 60T, was outfitted with the new inverted Gipsy III engine. The instructor's position was considerably improved by placing all of the center section struts ahead of the front cockpit so that he could stand up without hitting his head on the overhead fuel tank.

The ship went through extensive testing in September, 1931, and it was found that the lower wing-tip clearance was insufficient. The problem was solved by shortened interplane struts that raised the wing tips.

The first DH 82 Tiger Moth first flew in October 26, 1931, after which 35 of the little planes were built for the RAF. Orders were received from 25 other countries, among them China, Japan and Sweden.

Total production of the DH 82 version amounted to 135 planes. In 1934,

DH 82A
Tiger Moth

Performance	
Takeoff run	300 ft
Best rate of climb speed	65 mph
Rate of climb	1,400 fpm
Service ceiling	16,000 ft
Maximum cruise speed	160 mph
Cruise speed	95 mph
Cruising range	300 mi
Powerplant	
Engine	General Motors Holden's Gipsy Major 1
Rated horsepower	135
Rated speed	2400 rpm
Propeller	Geo. Adams DH5220/H/26, 6.33 ft.dia.
Dimensions	
Wing span	29 ft 4 in
Length	23 ft 11 in
Height	8 ft 9½ in
Weights	
Max weight, normal category	1,825 lbs.
Empty weight	1,115 lbs
Useful load	710 lbs
Baggage capacity	60 lbs.
Fuel and oil	
Fuel capacity	22.8 gals
Oil capacity	2.5 gals
Fuel grade	80

improvement in design led to an RAF shipment of 50 powered by the new 130-hp Gipsy Major engine. Before the outbreak of World War Two, there were 40 Tiger Moth flying schools operating up and down the English countryside.

Overseas production of the DH 82A Tiger Moth began in 1937 when deHavilland Aircraft of Canada Ltd. built 25 for the RCAF; a year later they supplied the parent company in Hatfield, England, with 200 fuselages.

By 1939, a total of 1,424 Tiger Moth 82As had been built in Canada, England, Sweden, Norway and Portugal.

Nearly all of Britain's civilian Tiger Moth fleet was pressed into service in 1939, and in 1941 were outfitted with the familiar antispinning strakes that fair the leading edge of the tailplane into the fuselage.

In 1941, British production of the DH 82A was moved to Oxford, where 3,433 were produced before war's end. Additionally, 1,095 were produced in Australia, 132 in New Zealand and 1,553 in Canada. The first Australian Tigers flew at Sydney in late 1940 with the bulk being shipped to the Royal Australian Air Force.

Canadian Tigers were redesigned to suit local conditions and fitted with 145-hp Major IC engines. Hand-operated Bendix brakes and a heavy-duty tailwheel were added for taxiing over rough ground.

The movie *Blue Max,* which starred many Tiger Moths, rekindled Harry's love for the ship, and in 1966 he began his search for a Tiger Moth of his own.

"After running down some leads, I located a Tiger Moth owned by C. H. Parsons in Queensland, Australia," Harry said. "We corresponded for nearly a year. I just couldn't get him to turn loose of the plane, but finally he gave in and I had it shipped to Houston."

Harry paid $1,000 down and another $1,000 in shipping costs.

"I picked the crates up November 10, 1967, in Houston. You can't imagine how I felt," he says.

Harry trucked the airplane to the base hobby shop at Randolph and dug into his arsenal of airplane know-how.

"As a boy, I had put together a couple of airplanes. I was flying pretty young—wing-walking and stuff like that. I never hesitated about rolling up my sleeves with the Moth."

Harry worked night and day, weekends, vacation—every spare minute. His wife, Vicki, brought down sandwiches and hot coffee. Harry stayed with his airplane until the wee hours of the morning.

"A thing like that gets pretty rough on a marriage." he admits. "But Vicki was pretty understanding about it. I guess I must have seemed like some kind of madman working on the plane so much."

Construction of the Moth went without a hitch. Harry borrowed the tools he needed and set to work restoring his plane.

"The real headache—and there's bound to be one in any project—finally showed up at painting time. The only way an airplane can acquire the certificate I have is for it to be exact in every detail. I had to write to the British Air Ministry to get the camouflage pattern. They were pretty sticky about my staying to detail. We mixed the paint and I sprayed on three coats of silver. Then we taped off the camouflage pattern and put seven coats of brown, green and yellow. The tough part was keeping the edges of the pattern the same thickness and razor sharp," he says.

Harry's attention to detail paid off majestically.

His other kingsize headache was certifying what he had built.

"That took nine months of the darnedest red tape you ever saw," he relates. "I had to get a permit from the State Department to import an implement of war." Almost everyone knows the Tiger Moth was a British trainer. But then most everyone knows our State Department. "Then I had to work out specifications with the Australian Department of Civil Aviation. The specs were flown to Hawaii by a friend of mine where they were checked out. I had to prove every step of the way that the airplane was just exactly as originally built."

Building the Moth was one adventure. Flying it, just lying under its wings on a sunny afternoon, taking it

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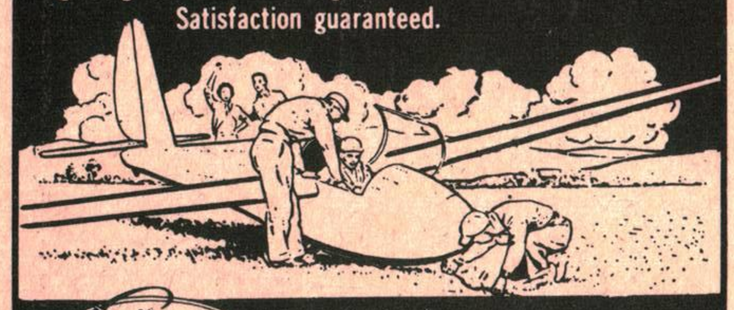


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Tiger Moth *continued from page 71*

into an international airport—all are another realm of the adventure of owning a Tiger Moth.

The 707 was almost loaded. A female passenger swinging a hat box cast a wary eye at the Moth.

"I'm not going on *that* thing," she chirped and hurried toward the luxury of the Boeing.

"I envy you guys," Thompson said, a wistful look in his eye. "I'll be glad to mail your letter."

A few moments later, we were waiting at the runway intersection for a go signal. Thompson and his 600-mph jet shot past us on the runway. It wasn't hard to see his thumbs-up salute and broad smile as the mammoth 707 arched its head up, its billowy exhaust embracing all of us in the warm camaraderie of airmen.

At a brisk 80 mph we headed home, each lost in his own thoughts. We roared in over the grass strip and executed a perfect inside loop.

Hanging there upside down, I was reminded of happy kids who kick tin cans into the street—"Look, Ma, no hands"—and a million other jubilant expressions. Flying gets into your blood like a woman, like that little farm back in Wyoming. Like dope and wire and goggles.

You don't express it adequately. You just do it.

And delivering mail in a Tiger Moth is the *only* way to do it.

Nick Jones *continued from page 53*

But it was in the third race of 1966, at Frederick, Maryland, that Nick Jones attracted the greatest attention. Still in his rookie year, he qualified in a tie for first with Steve Wittman, in a field of 12 Formula Ones, and then miraculously escaped death after colliding with Jerry Quarton in front of the home pylon, near the end of the championship race.

Though #3 was ruined, Jones was undaunted and spent the winter rebuilding it into what he felt was a much faster airplane. Few people ever saw it, except as a pile of rubble next to a hangar at a little field near Fort Worth. Torsional flutter caused the wings to disintegrate during a 300-mph test dive, and Nick was barely able to save his neck with a parachute.

"It took a hell of a lot of the fun out of racing for awhile after that, because the Fort Worth experience was very frightening, very terrifying. I have a theory about things that scare you," Nick explained. "The main thing is how long you are in danger and whether or not you are moving constructively toward safety. Now, in Fort Worth, I was in danger a long time. I was going straight down with no wings on the airplane and I wasn't moving toward safety at all. I couldn't get my hand on the canopy latch to bail out; I was moving toward danger, to the ground. And that engine wasn't letting me forget it! The prop had gone beyond the speed of sound, and the pitch was getting louder and louder and louder, and higher and higher and higher, and I could tell that I was accelerating like hell.

"So, that thing had a bad psychological effect on me. I remember, about three weeks after that, I was driving along in an automobile and a bug splattered on the windshield; I had a bad reaction from it. I've had a lot of scrapes in airplanes—close calls—and none of them had ever bothered me after they were over. Just hadn't bothered me at all, that I could tell. And this one did, and I could tell it.

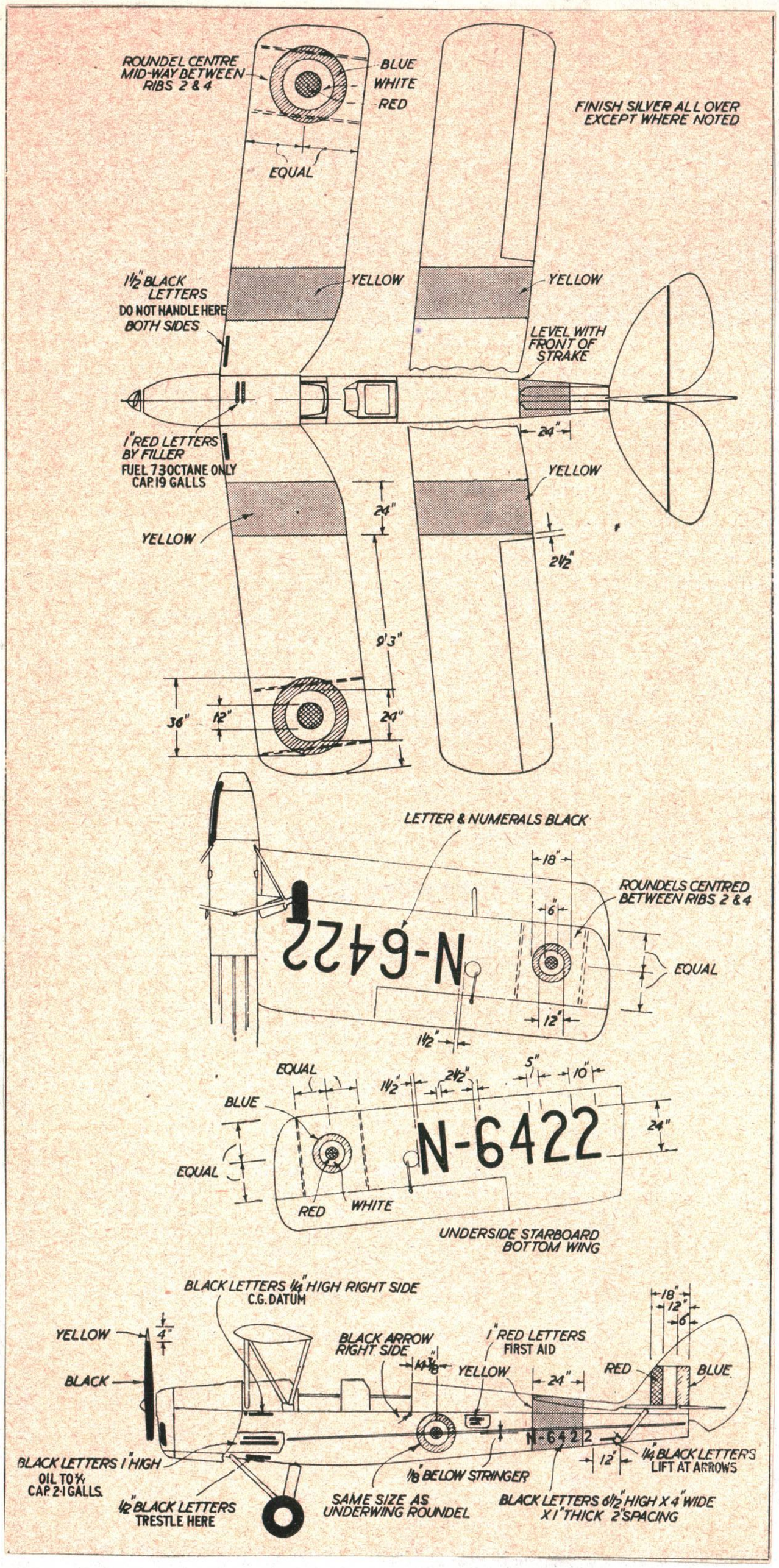
"One thing about that Fort Worth experience: It has damn sure taken the thrill out of high-speed power dives. It just ain't fun anymore! You're just only too happy to slow that thing down and get the nose back up!"

His next race, at Cleveland, is one Nick Jones remembers very vividly. "I went up there without a ride, and Leo Holliday got there with *Miss Dallas*, his Denight Special, and no pilot, so he wanted me to fly it. I took the thing up for about 20 minutes and got familiar with it a little bit, and flew what I considered to be a very, very sorry first heat. I was in propwash pretty bad, and I finished one position back from where I thought I should have finished, just with an adequately flown race. And I was very dejected and depressed about this. This, of course, had happened after my wings had come off at Fort Worth and I needed to be in an airplane; I need to get some time in a racer. That's why I leaped at this opportunity to fly another plane.

"I felt that Fort Worth thing had had an effect on me, and, of course, it had. I was very depressed that night, and the next day I got the course for about a half hour and went up and flew. When I got down, Leo and his brother Hollis both told me, 'Well, you were looking a lot better, but you were still going up a little bit in the turns.' And I told them, I said, 'Yeh, I know it, but the difference is now I *know* when I'm going up in the turns.'

"I flew that heat and came in second, and I think I flew a perfect race. If I went up any in the turns, people on the ground said they couldn't see it. And I couldn't see it. I'd gotten familiar enough with the plane to know

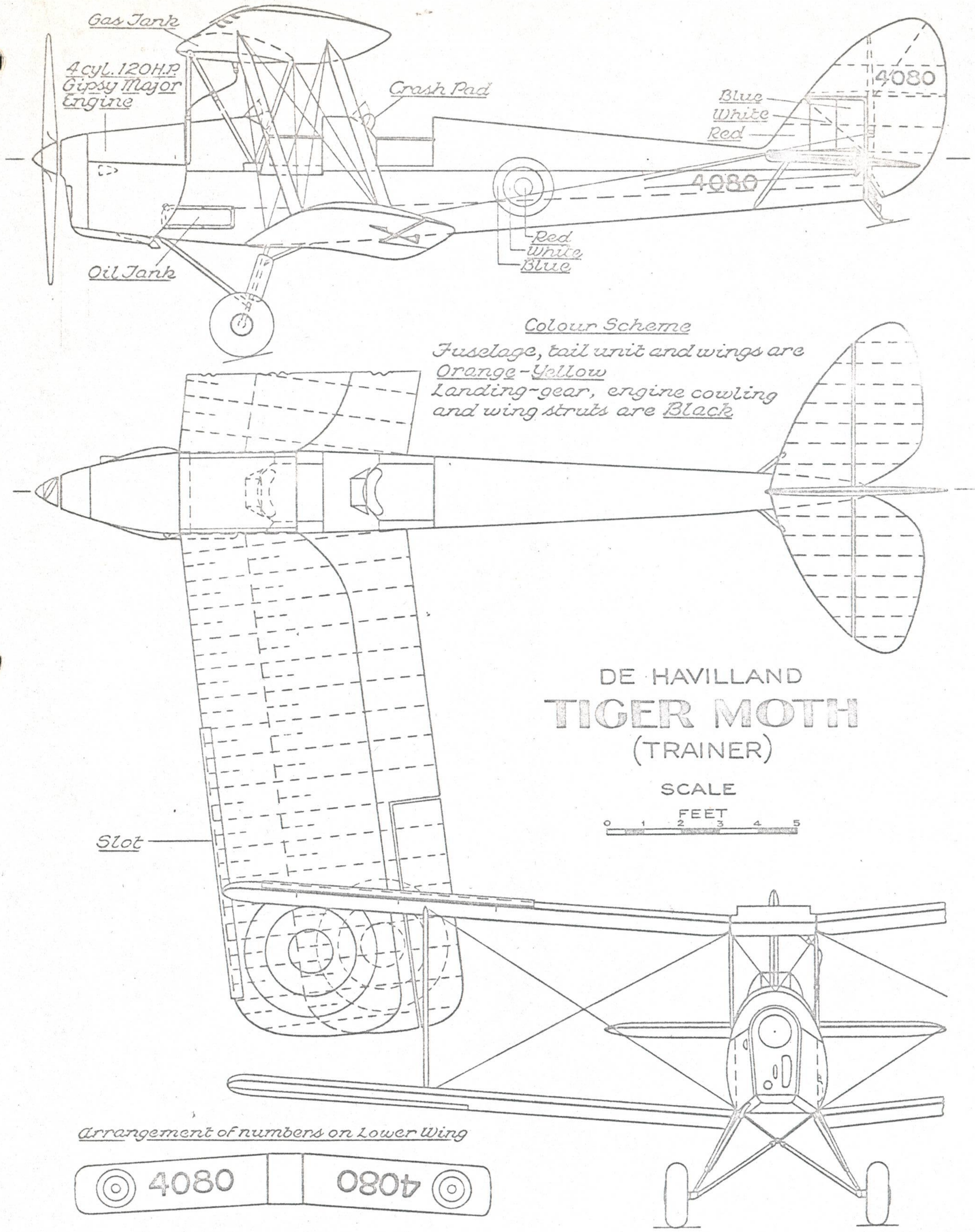
DE HAVILLAND TIGER MOTH



Pre-war Tigers were finished in yellow overall, and in fact this scheme was continued in the first few months of the war. However, until December, 1940, *Tiger Moths* operating within reach of the Luftwaffe were camouflaged on the upper surfaces to a point half-way down the fuselage. After this date the camouflage was carried to the bottom line of the fuselage.

Serial numbers were in black on the yellow undersurfaces, and it is interesting to note that the hyphen between the letter and the number was peculiar to de Havilland aircraft.

A typical post-war silver finish for the *Tiger Moth* is shown in the drawing opposite. As always, reference to photographs is advised for details of individual markings.



DE HAVILLAND

TIGER MOTH

(TRAINER)

SCALE

FEET 0 1 2 3 4 5

Arrangement of numbers on Lower Wing

L. A. Williams -41.

TECHNICAL DATA

Description:

Manufacturer:

Power Plant:

Dimensions: Span Length Height

Weights: Empty Loaded

Performance:

Armament:

SQUADRON ALLOCATIONS

Canada:

Overseas:

601 Duff Cresc.
Ottawa, Ont
K1J 7C6
22 Apr 1977

Dear Jack,

We will be waiting whenever you are ready, it is a long standing invitation.

Menasco Moth 82C2 Mk. I

A standard Tiger Moth with an engine change and British radio equipment installed in the rear cockpit. The first 9 were tested and found underpowered and very cramped for the student operator. It was observed that it would be difficult to get out of with a 'chute.

Menasco Moth 82C4 MK. II

These were production aircraft fitted with a Menasco D-4 engine of 132 h.p. Fuel tankage reduced from 19 gals. to 14 gals.

The radio was RAF equipment weighing 146 lbs and the battery weighed 45 lbs. Additionally the aircraft was cotton covered which required more dope estimated at 3 lbs. The gross weight was 1869 lbs with all non-essentials stripped out.

You can see the deck between cockpits has been removed to provide more room in the aft cockpit.

Was a dual pilot trainer

8 2 C 2 MM MR I
4936-44 (9)

8 2 C 4 MM MR II
4810-4933 (126)
4935, 4945

8 2 C 4 MM MR III
4934 (1)

Menasco D-4 ~~135~~ 132 h.p.
2 C-4 = 125 h.p.

MR I. = Std tiger with menasco engine
22 sept 40 report.

MR II Gross wt. 1869 lbs
with 14 gals fuel
instead of Tiger's 19
Shi plane = 1925 lbs.
RAF Radio Equip.
= 146 lbs.
wind driven generator
antenna

MR III 15 Aug 41
cleaned up with
Canadian built radio
incase UK. supply failed.
(Canadian G.P.I)

both 8 2 C 4 MK. III

IF (4934) and the
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the supply never failed.
for more III's never

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by the Fleet Fort.
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inter and an operator
was a very reluctant

his helps your buddy

All the best

John.

oth 8204 Mk. III

If (4934) and the
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ply of equipment, Canada
gder and proved out
the supply never failed.
for more III's never

Meussco Moth is
29 lbs heavier than
Tiger due to heavier
engine
C of G is 1/4" further
forward.

Tiger I Gipsey = 135 h.p. 107
Meussco 132 h.p. 96 m.p.h.

Meussco II Tare wt.
Battery 4516.
A/c Cotton covered &
absorbes 3 lbs extra
dope.

co Moth was a dog
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- by the Fleet Fort.
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was a very reluctant

his helps your buddy

All the best

John.

Menasco Moth 8204 Mk. III

Only one built (4934) and the only difference wass in the radio equipment installed. Fearing an end to the British supply of equipment, Canada produced similar gear and proved out the installation — the supply never failed and the need for more III's never arose.

The Menasco Moth was a dog that carried the weight of three crew members (2 + a radio) and had the performance to prove it. It was a stop-gap solution and later was replaced with the Stinson 10A and still later by the Fleet Fort.

The aft cockpit was so cramped that the operator could not wear winter flying kit. Tigers were really cold cats in winter and an operator in light clothing was a very reluctant passenger.

Hope this helps your buddy

All the best

John.

MEMORANDUM

September 22nd, 1940

To: D.D.A.S.
Air Headquarters

Subject: Experimental G.P.I. in Tiger Moth

1. Herewith a summary of progress in the development of the above noted installation, covering the period from the 17th instant, when the prototype was flown to Montreal, to date. It is understood that a consolidated written report from No. 3 Training Command and No. 1 Wireless School will be forwarded to Air Headquarters within the next day or two.

2. The prototype was inspected by Wing Commander Scott and Squadron Leader Godwin. It was test flown by Wing Commanders Fullerton and Shaw, Squadron Leader Foley, Flight Lieutenant Walmsley and Flying Office Shelton. During these test flights the radio installation was operated by Sergeant Major Marshall and other personnel of No. 1 Wireless School and by the undersigned. All tests were conducted with pilot, operator, full load of fuel and complete radio load (less charging generator) aboard. Climb tests were conducted with the same load and, in addition, ballast was added to bring the gross weight up to include 400 lbs. for the weight of pilot, operator and two parachutes. The results of these tests will be incorporated in the consolidated report referred to in para. 1.

3. In general it may be said that the prototype completed all tests satisfactorily. The take-off, rate of climb and handling qualities of the aircraft in normal flight appeared to meet the requirements of air operating. However, it was generally agreed that the aircraft was heavily loaded and had a very small reserve of power. Although climb tests have been completed satisfactorily with the prototype up to 8,000 feet above sea level, it has been impossible to simulate the conditions of take-off at Calgary, which is 3,200 feet above sea level. Substitution of a lower powered engine, such as the 125 h.p. Monasco C-4, would, therefore, seem to be impracticable.

4. It was noticed that the proximity of the 80 watt motor-generator to the instrument panel in the forward cockpit causes a deviation of about 30 to 40 degrees in the compass when the generator is running. As flying will no doubt be necessary under conditions where the pilot will be required to set a compass course, or refer to the compass for orientation, it will be necessary to eliminate this deviation, or at least reduce it substantially. This may be possible by completely enclosing the generator in a grounded sheet metal box. If this does not achieve the desired result, it may be necessary to re-locate the generator.

5. Restriction of space in the operator's cockpit makes an emergency exit from this position while in flight most difficult. Any modifications which will afford more space in this cockpit will improve this condition but, at the best, it cannot be considered as satisfactory. The emergency release for the hood in the rear cockpit is difficult to reach with the hood closed and the radio instruments installed. The hand fire extinguisher normally mounted in the rear cockpit of the standard Tiger Moth has been removed in the prototype for reasons of weight and space. It is recommended that this extinguisher be replaced as there is no means of combatting fire in the aircraft, other than the extinguisher which operates on the engine.

6. From the radio standpoint, the installation is practicable but not entirely satisfactory for training becuase of space limitations. A number of recommended modifications to the installation are given in Appendix "A", some of which are designed to give the operator greater freedom of movement. This consideration would seem to be of prime importance as anything which can be done to add to the convenience of operation and the comfort of the operator will enhance the value of the very limited time allotted to air operating in the W.A.G. syllabus. Conversely, the difficulties of operation arising from a cramped installation reduce the benefits of the time spent in the air, especially with inexperienced operators-under-training. In this connection it will be obvious that the convenience of installation, operation and maintenance possible in a cabin aircraft cannot be achieved in a light, tandom-seater aircraft. Some flights were made at Montreal with the pilot and operator wearing full winter flying clothing. Although the pilot reported that he was not unduly cramped after a 2hour flight, the operator found that his movements were considerably restricted by the extra clothing. The existing sliding writing board in the prototype, which seems to be the best arrangement possible, willnot permit use of the standard W/T log. However, this log could probably be cut in half and used, or pads of special log forms of approximately the same dimensions as the Form 96 message sheets could be procured for this purpose.

7. Tests on the belly-mounted, type C.1 loop conducted in Montreal were not satisfactory. Bearings on the St. Hubert radio range could not be obtained at distances over 6 miles. This is attributed to the poor match between the loop and the receiver input, and also to the fact that the physical dimensions of the loop do not provide adequate pick-up for a low gain receiver, such as the R.1082. It is possible that the match between the loop and the receiver input might be improved by removing turns from the coupling winding on the receiver aerial coil to provide a closer impedance match and some degree of loop turning, also by removing the centre-tapped ground connection on this coupling winding. It is estimated that satisfactory bearings might be obtained up to 20 miles or more from a sufficiently powerful ground station by these changes. The limiting factor would be the field

strength of the transmitting station, which must be relatively high to ensure adequate pick-up to the low gain receiver for a reasonably sharp bearing. All D/F tests to date have been conducted with Range "N" coils. In view of the fact that, to tune over the frequency band in which radio ranges operate, Ranges "N" and "M" must be used, it is suggested that further experimentation on matching the loop to the R.1082 receiver might be done on a set of coils tuning part of the broadcast band as if only one aerial coil is to be re-designed, it is more likely that a coil covering standard broadcast frequencies would meet frequency requirements in Montreal, Calgary, Winnipeg and Guelph, where wireless schools are or will be located. On the other hand, if it desired to use the loop as an aid to navigation, as well as to provide practice in obtaining bearings, it is recommended that the aerial coils for Ranges "N" and "M" be re-designed as these coils will cover all frequencies on which radio ranges transmit and these stations are more often accurately located on maps used for aerial navigation than broadcast stations.

8. If the prototype successfully completes spin tests at Ottawa Air Station, it is recommended that the aircraft be returned to the DeHavilland factory at Toronto for the modifications suggested in Appendix "A", and also for the installation of a 135 h.p. Monasco D-4 engine, Eclipse 308 generator and control box in lieu of the Gypsy Major IC engine now installed, if these latter items are available. If it is decided to leave the Gypsy Major engine in the prototype, it is suggested that a Lear 1030-A, or other suitable and available wind-driven generator be installed, either mounted on the starboard diagonal rigging member or faired into the upper port wing. This work could be done most readily at the factory and the modifications could be placed in work pending the arrival of the Monasco engine and Eclipse generator, or the wind-driven generator, depending on which engine is to be used.

E. A. D. Hutton, Flight Lieut.

APPENDIX "A" - DEVELOPMENT REPORT

Modifications

1. Move aerial winch 1" higher on mounting plate.

2. Run control cables behind winch mounting and set winch flush on mounting plate.

3. Mount loop control unit further forward by bending bracket over head rest.

4. Move loop mounting 1" to 2" nearer centre line of aircraft, cutting stringer and splicing or re-positioning stringer if necessary. Alternatively, replacing existing control unit with type giving opposite direction of drive.

5. Provide shock cord fitting from starboard side of transmitter to head rest.

6. Set transmitter and receiver 2" further forward on mounting tray.

7. Replace "U" mounting bracket for neutralizing unit with inverted "L" bracket.

8. Provide false plate and bolts with wing nuts on key mount to permit quick removal.

9. Strengthen head rest with ash or other former.

10. Remove battery box drain tubes and level floors of these boxes.

11. Provide cut-out for microphone socket on starboard side of forward cockpit.

12. Shield 80 watt motor-generator to reduce magnetic effect.

13. Provide fire extinguisher mount on control housing in rear cockpit.

14. Provide removable bulge in fire wall for generator mounting with Monasco engine, re-designing front diagonal members if necessary. Alternatively, design wind-driven generator mount if Gypsy Major engine to be used.

15. Provide fittings on wooden bearing over upper longeron on port side of both cockpits for attaching type B telephone jacks.

16. Substitute treadboards in lieu of walkways on lower wings to reduce tare weight.

Additional Work

1. Adapt receiver input to type C.1 loop on selected coil ranges.

REPORT ON ZP INTERNAL TOUR
NO. 2 WIRELESS SCHOOL.

Menasco Moth Wireless Trainer 24-3-41 - P/O A. Struenell (44935)

Ref:- No. 4 Training Command 1038 TT-1, RCW 0/13/41, dated 18-3-41.

MOLSON

SUMMARY

OBJECT OF INVESTIGATION:-

To ascertain the suitability of the Menasco Moth Wireless Trainer for operating at this unit in view of the 3545 foot elevation at Calgary.

RANGE OF INVESTIGATION:-

1. Tests carried out were climbing, rate of climb, maximum speed, stalling, spinning, landing, with gross weight of 1870 lbs.

CONCLUSIONS:-

1. Take-off:- 20 seconds - - - 100 yards (approx).

2. Rate of climb:-

From 3545 ft. to 4545 ft. (above sea level) 3 Mins. 0 Secs. - 333 ft. per Minute.
" 0 " to 1000 ft.

" 4545 " to 5545 " (above sea level) 3 " 40 " - 273 " " " .
" 1000 " to 2000 "

" 5545 " to 6545 " (above sea level) 4 " 25 " - 227 " " " .
" 2000 " to 3000 "

" 6545 " to 7545 " (above sea level) 5 " 15 " - 190 " " " .
" 3000 " to 4000"

" 7545 " to 8545 " (above sea level) 5 " 55 " - 169 " " " .
" 4000 " to 5000 "

" 8545 " to 9545 " (above sea level) 8 " 35 " - 116 " " " .
" 5000 " to 6000 "

" 9545 " to 10545 " (above sea level) 10 " 55 " - 92 " " " .
" 6000 " to 7000 "

" 10545 " to 11545 " (above sea level) 14 " 03 " - 71 " " " .
" 7000 " to 8000 "

Total time to reach 8000 ft. above ground level (11545 ft. above sea level) - 55 Minutes - 48 Seconds.

Heights greater than this were not attempted as the rate of climb was becoming too slow.

3. Maximum speed.
The top speed at 11545 ft. (8000 ft. above ground) - 75 M.P.H. indicated.
The top speed at 5545 ft. (2000 ft. above ground) - 83 M.P.H. indicated.

4. Stalling speed.
Stalling speed at 11545 ft. (8000 ft. above ground) - 42 M.P.H. indicated.
Stalling speed at 5545 ft. (2000 ft. above ground) - 45 M.P.H. indicated.

5. Spinning.
Spinning to right from 6000 ft. above ground - 3 turns and recovery in 1000 ft.
Spinning to left from 6000 ft. above ground - 4 turns and recovery in 1200 ft.
It was noticed that the spin to right was quite normal, although the nose was inclined to drop, but in the spin to left the spin was faster and the nose dropped more than to the right. The aircraft recovered quite quickly.

6. Landing.
Aircraft landed normally. Gliding speed was increased to 70 M.P.H. to compensate for load.

MOLSON

FURTHER DEVELOPMENTS:-

1. These results were obtained under ideal conditions and it is considered that a further test should be made under summer conditions, where rarified atmosphere would possibly cut down the rate of climb and altitude obtained.

A Strugnell

(A. Strugnell) Flying Officer,
i/c Air Operating Section.

AS:ML.

M E M O R A N D U M

1021-20-19

April 4, 1941.

MOLSON

(1)

D.A.E.

Menasco Moth Wireless Trainer

1. Attached is a report of No. 4 Training Command on operation of the above aircraft at the altitude of Calgary.

2. It is to be noted that the rate of climb for the first 1000 ft. is 333 ft. per minute. This corresponds to slightly below 500 ft. a minute at sea level and tallies well with the figure of exactly 500 ft. a minute obtained at Rockcliffe on tests of this aircraft as a land plane. The ski plane was tested at 1870 pounds and the land plane at 1874, whereas the gross weight as a ski plane will be 1923 pounds allowing for the saving of 35 pounds effected by the reduction of the permissible fuel load from 19 gallons to 14 gallons. It is also observed that, as stated in the final paragraph of the report, a slightly reduced performance is to be expected on a hot summer's day.

3. O. C., No. 2 Wireless School, states "it would appear that normal operation of these aircraft will probably be safe and satisfactory at Calgary". Will you please indicate your concurrence with this recommendation.

(2)

AMT DTI DNT

Concur in conclusion of OC No 2 Wireless School. In winter the atmosphere is usually a little denser and the extra weight involved in skiis will not be serious combined with loss of performance on a hot day in summer.

A Fleming
Sk
Engine.
2/4/41

(A. F. Britton)
Wing Commander,
D/D.A.D.2

C O P Y

DEPARTMENT OF NATIONAL DEFENCE

AIR SERVICE

1021-20-19 (AMAE:D/DAD)

OTTAWA CANADA April 7th, 1941.

MOLSON

The DeHavilland Aircraft of Canada Ltd.,
Postal Station "L"
Toronto, Ontario.

Attention: Mr. C.D. Long

Subject: Menasco Moth II - Weight & Balance

Dear Sir:

Wireless schools operating the above mentioned aircraft have requested weight data consisting of the following:

Tare Weight	- 1354 lbs.
Normal Gross Weight	- 1869 "
Maximum Permissible Weight	- 1869 "
Fuel Capacity	- 14 gallons
Oil Capacity	- 2 gallons

You will note that the fuel capacity has been reduced from 19 gallons to 14 gallons in order to keep the weight down. Please inform if you concur with these figures.

It would also be appreciated if you could forward a C.G. diagram of this aircraft.

A.H. Black
Flying Officer
for Chief of the Air Staff.

C O P Y

April 11, 1941.

MOLSON

Our Ref. WHJ/JH, 4A/14

Chief of the Air Staff,
Department of National Defence,
Air Service,
Ottawa, Ont.

Your Ref: 1021-20-19
(AMAE:D/DAD)

Dear Sir:

Attention: F/O A.H. Black

Menasco Moth II - Weight & Balance

Further to your letter dated April 7, 1941, we submit for your consideration the following figures on the DH82C4 Menasco Radio Trainer:

Tare Weight	-	1354 lbs.
Pilot	-	200 "
Radio Operation	-	200 "
Petrol (14 gal)	-	100 "
Oil (2 gal)		18 "
		1872

Might we draw your attention to paragraph 69 of A.P./27.

Enclosed herewith please find one print of the C.G. diagram as required by you.

Yours very truly,

THE DEHAVILLAND AIRCRAFT OF CANADA LTD.

Wm H. Jackson
Design Office.

C O P Y

DEPARTMENT OF NATIONAL DEFENCE

AIR SERVICE

File No. 1021-20-19
(AMAE:D/DAD)

MOLSON

Ottawa Canada April 16/41

DeHavilland Aircraft of Canada Ltd.,
Postal Station "L"
Toronto, Ontario.

Attention: Mr. W.H. Jackson

Subject: Menasco Moth II - Weight & Balance

Ref: Your WJH/JH 4A/14 dated April 11/41

Dear Sir:

This will acknowledge receipt of your above mentioned letter and C.G. diagram for Menasco Moth II aircraft. Regarding gross weight of this aircraft, a Menasco Moth II has been flown equipped with skis, and has been reported as satisfactory. The ski-plane was flown at 1923 pds.

May we have your comments on flying Menasco Moth II at a gross weight of 1923 pds., please.

It seems useless to limit the gasoline load to 14 gals. to keep the gross weight under 1875 and then fly the aircraft as a ski-plane at 1923.

Performance data on this aircraft at a gross weight of 1872 pds. is also requested. We have performance figures on this aircraft, but none were carried out at the proper weight.

If this data is available in your office, it would be appreciated if same were forwarded at your earliest convenience.

Yours truly,

A.H. Black Flying Officer,
for Chief of the Air Staff.

COPY

April 18, 1941.

MOLSON

Our Ref: WHJ/JH, 4A/14
Your Ref: 1021-20-19 (AMAE:D/DAD)

Chief of the Air Staff,
Department of National Defence,
Ottawa, Ont.

Dear Sir: Attention F/O A.H. Black

Re: Menasco Moth II Weight and Balance

1. It is felt here that the Menasco Moth II is already flying at a great disadvantage; the decrease in engine power caused by replacing the Gipsy Major engine with a Menasco D4 engine, together with the present overloading, due to the radio equipment, have proven very deleterious to the original Moth performance.

2. We do not like the idea of any further overloading, as suggested by you. In addition to this there will also be the extra drag added by the ski installation to further tax the engine. Inasmuch as the aircraft was developed for wheel operation, we feel that it should remain as such unless the radio equipment can be lightened.

As regards performance, we regret that we have not these figures available, since the type test was carried out by you at Test and Development, Rockcliff. However, the influence of weight on performance is readily calculable providing the weight changes are not too great. Might we draw your attention to the handbook of Aeronautics, Vol. 1

Yours very truly,

THE DEHAVILLAND AIRCRAFT OF CANADA LTD.

Wm. H. Jackson
Design Office.

M E M O R A N D U M

1021-20-19

File ~~1200-26T1-8~~

MOLSON

May 14, 1941.

D/D.A.D.

Menasco Moth Interchangeability List

1. Herewith attached, for your information, the Menasco Moth Interchangeability List as follows:

Additional Parts for DH 82C3 and DH 82C4 Aircraft
Page 1 - 4.

Deleted Parts for DH 82C3 and DH 82C4 Aircraft
Page 1 - 3.

PD:
For reference.

for (R. P. Cauthery),
Wing Commander,
D/DMP.

Noted.
Instructions Pd.
AVB.

→ { 82C3 = Tiger Moth II
82C4 = Menasco Moth II

MOLSON

REPORT ON EXPERIMENTAL WORK

TEST & DEVELOPMENT ESTABLISHMENT

R.C.A.F. STATION ROCKCLIFFE ONTARIO

REPORT NO. 382

on

MENASCO MOTH III WIRELESS TRAINER

by

FLIGHT LIEUTENANT H. R. McLAUGHLIN

AUGUST 15, 1941

Reference: H.Q.1021-20-19(AMAE/DAE)
O.O. D/70/41

SUMMARY

PURPOSE OF INVESTIGATION

To test the installation of G.P. Wireless equipment in a Menasco Moth III under operation conditions.

RANGE OF INVESTIGATION

Flight and ground tests of equipment were carried out at Rockcliffe Station R.C.A.F. A low tension filter was installed along with additional by-pass condensers to eliminate as far as possible the generator and ignition "hash."

CONCLUSIONS

The installation is now judged to be satisfactory for use as a Wireless Trainer. Continuous tests carried out up to 50 miles under various weather and atmospheric conditions were satisfactory on C.W. - M.C.W. - RT.

The aircraft is judged to be an improvement over the Menasco Moth II in flying characteristics being more stable longitudinally.

DAE a-7.
AMAE.
DAT
DORD doa.
for information

MENASCO MOTH III WIRELESS TRAINER (CONT'D)

MOLSON

BODY OF REPORT

I INTRODUCTION

The Menasco Moth III Wireless School Trainer is equipped with an R.C.A.F. G.P. set working off a 25 amp. hour battery which is charged by an Eclipse generator coupled directly to the engine. The G.P. set is capable of CW. MCW. RT and DF.

The attached phtoographs show the views of the installation.

II DESCRIPTION OF EXPERIMENTAL METHODS

The machine was supplied by the manufacturer with the equipment installed. This included the antenna lead-in taped to the centre section inter-wing strut on the port sideand carried the length of the wing in it's interior. To remove the resultant high capacity effect of this form of installation, the lead-in was changed to run directly from the stand-off insulator on port side of the fuselage to a point on the aerial approximately ten feet from the port wing tip.

Generator noise was found to be particularly bad. To get rid of this an Eclipse L.T. filter was installed immediately before the 12 volt supply is fed to the set. To further reduce noise, a 1/2 Mfd. 600 volt condenser was installed between the "Field input" terminal of the voltage regulator unit and ground. A similar condenser was put between "pos" input to the voltage regulator and ground. The negative lead was grounded directly at the input to the voltage regulator unit and again in the junction box. Further filtering was deemed unnecessary.

As supplied by the manufacturer, the inter-communication was not a connected, the wires having been cut short in the cables. New wires were drawnin to complete this installation.

III STATEMENT AND DISCUSSION OF RESULTS

The aircraft and installation were given flight tests up to 50 miles range from Test and Development Establishment. The wireless installation proved satisfactory on CW, MCW and RT. The aircraft in flight is longitudinally more stable than Moth Wireless Trainer II and has an absolute ceiling of about 7000 feet above sea level.

IV CONCLUSIONS

The installation is now judged to be satisfactory for use as a Wireless Trainer. Continuous tests carried out up to 50 miles range under various weather and atmospheric conditions were satisfactory on C.W. - M.C.W. - RT.

The aircraft is judged to be an improvement over the Menasco Moth II Wireless Trainer in flying characteristics, being more stable longitudinally.

H. R. McLaughlin

(H. R. McLaughlin) Flight Lieutenant,
Signals Officer,
Test & Development Establishment,
R.C.A.F. Station, Rockcliffe, Ontario.

T. R. Loudon

(T. R. Loudon) Wing Commander,
O.C. Test & Development Establishment,
R.C.A.F. Station, Rockcliffe, Ontario.

M E M O R A N D U M

File 1021-20-19

MOLSON

August 20, 1941.

D/D.R.D.

Menasco Moth III

1. Please note attached Test & Development Report No. 382. The Menasco Moth III is a Wireless Trainer fitted with Canadian built radio equipment and the ~~photostat~~ prototype was produced just in case the supply of British radio equipment should fail.

2. Please investigate the situation concerning the supply of British radio equipment and then pass the report to A.M.P. to note.

(2)

QMQS DAS
Can you advise pse.
re para (2).
Hollins S/L
for D/DRD
AMAE

(A. Ferrier),
Group Captain,
D.A.E.

(3)

DDRD.

The supply of RAF aircraft radio equipment is now satisfactory.

(4) 3/9/41 Maskell Sqdn. Ldr. DAS/S4.

AMT/DTT.

To note please return to DDRD.

3/9/41 Maskell Sqdn Ldr DAS/S4

16

M E M O R A N D U M

MOLSON

1021-20-19
August 22, 1941.

D/DAD (attn. Wg. Comdr. Britton)

Technical Aspects of Menasco Moth
Prototype Menasco Moth III (Canadian G.P.I.)

1. I inspected the subject prototype aircraft at Test and Development Squadron on the 21-8-41 and flew in it. Certain modifications to the radio installation are necessary to satisfy training requirements and a report has been passed to D/DRD on these points. In general, it may be said that, although the Type III is unlikely to be as satisfactory for W.A.G. training as the Type II, it has possibilities as an alternative type. It may be regarded as a form of insurance in the event of a larger number of two-seater wireless trainers being required combined with a possible shortage of the R.A.F. sets with which the Type II is equipped.

2. The modifications to the radio installation which are required are not likely to affect the flying qualities of the aircraft or the gross weight. It is requested, therefore, that you arrange for appropriate service flying trials to be completed on the prototype. When the flying trials and radio modifications have been satisfactorily completed, I will arrange for the aircraft to be flown to Montreal for further tests at No. 1 Wireless School.

E.A.D. Hutton

(E.A.D. Hutton)
Squadron Leader,
a/TW

Action ✓
Circulation
T.W.2
Spare

CANADA

IN REPLY PLEASE QUOTE

NO. 1032 TT-2
(S.A.E.O. Eng-1)

Department of National Defence
"Air Force"

Ref: Your 1021-20-19 (AMAE/D.DAD2)
Dated: October 16, 1941

Calgary, Alberta, October 29th 1941

MOLSON

The Secretary,
Department of National Defence for Air,
Ottawa, Ontario.

Sq Ld. McDonald
382

Menasco Moth II - Gross Weight

1. On receipt of your referenced letter, further investigation was carried out in an endeavour to discover the discrepancy in the gross weight of the above noted aircraft. On discovering that the present radio equipment installed in Menasco aircraft weighs 146.2 pounds, the following weight table was drawn up:-

ITEM	INTENDED	ACTUAL	
Tare	1184	1246	
Radio	170 (1354)	146	* As per our letter of even file dated 13-10-41
Fuel (19 gals)	135	135	
Oil (2 gals)	18	18	
Sub-Total		1545*	
Parachutes	44	44	
Pilots	357	319	
TOTAL	1908	1908	

2. It is seen from this table that a discrepancy of 62 pounds exists in the tare weight, 24 lbs. of which is gained in the radio installation which requires that the allowable pilot load is jeopardized by 38 lbs. Consequently, No. 10 Repair Depot was requested to check the tare weight of the Menasco Moth and it was found to be 1238.25 lbs.

3. It appears, therefore, that the figure of 1184 lbs. allowed as the tare weight on this aircraft is being exceeded and it is requested that this figure be checked and advice forwarded to this Command Headquarters.

(J.A.Verner) Wing Commander,
for Air Officer Commanding,
No. 4 Training Command,
Calgary, Alberta.

M. F. B. 239
1050M—4-40 (4927-S-9)
H.Q. 1772-39-194

P.H.

MEMORANDUM

~~1021-20-14~~
1021-20-19

MOLSON

November 3, 1941.

D/D.A.D.2.

Visit to De Havilland Aircraft of Canada
October 31, 1941, and November 1, 1941.

1. The purpose of the visit was to determine the departures from the Tiger Moth Specification necessary for the construction of the Menasco Moth I built to the Tiger Moth Specification and Appendix "A".

2. The main differences are:-

(a) Tare Weight - The tare weight of the Menasco Moth I is 1229 lbs. This is 29 lbs. over that of the Tiger Moth I and is due to the increased weight of the Menasco D.4 Engine. This means a forward shift of the centre of gravity of approximately 1¼ inches.

(b) The amendments to the Tiger Moth Drawing List include the following changes:-

(i) Item	Tiger Moth I-S2C	Menasco Moth I-S2C2
Fuselage	2940	2926
Complete Fuselage	2939	2933
Cowling Installation	DHC 1470	DHC 1470B
Exhaust Heating	DHC 1548B	DHC 1548C
Engine Installation	G.A.5220	DHC 2040
Fire Extinguisher	DHC 1522	DHC 2239
Ignition Wiring	DHC 2031	DHC 2240

(c) Performance Figures at 1825 lbs. weight:-

Item	Tiger Moth I	Menasco Moth I
Engine Power Max.	135 ~~H.P.~~ @ 2350 RPM	132 ~~H.P.~~ @ 2300
Engine Power Normal Cont.	120 ~~H.P.~~ @ 2100 r.p.m.	125 ~~H.P.~~ @ 2075 R.P.M.
Recommended Cruising	1900-1850 ~~r.p.m.~~	1900-1950 ~~r.p.m.~~
Maximum Speed	107 m.p.h.	96 mph.
Cruising Speed	90 m.p.h.	80 m.p.h.
Take-off Run	100 yds.	120 yds.
Rate of Climb	750 ft./min.	600 ft./min.
Service Ceiling	14600ft.	12000 ft.
Cruising Range	275 miles	300 miles.

(d) The instruments called up in the Appendix "A" - Serial No. 5 (Can.), with the exception of the engine accessories, are the same for both aircraft. There is no night flying equipment in the Menasco Moth I.

3. The following possible modifications to Tiger Moth I Aircraft were discussed:-

(a) Bowden Cables - The Canada Wire and Cable Company type of cable is used in all DHS2C Aircraft for the brake and elevator tab controls. D/D.M. report that no trouble has been experienced with these cables as yet.

(b) Brake Cable Pulleys - The re-alignment of the brake cable pulleys in such a way as to eliminate wear was discussed. Drawings are being prepared by De Havilland and will be forwarded when completed.

(c) Platform Ribs - the failure of the platform rib webs was taken up with Mr. C.D. Long at De Havilland. It was suggested that service aircraft be repaired by plywood reinforcement strips on both sides of the spruce webs. Drawings are to be made

incorporating a new plywood web for production aircraft.

(d) Aileron Cable Wear - The lever shackle at the cable connections on production aircraft has been modified to eliminate binding at the extremity of the movements of the control stick in a lateral direction. Also the cable connection of the shackle has been offset slightly forward. These changes combined with the slightly higher cut fairlead relieved to some extent the cable pressure on the fairlead and may increase the life of the cables.

(e) Cast Aluminum Ski Pedestal - A new cast aluminum ski pedestal prototype, drawings of which have been received at this Headquarters, is being made at De Havillands and is to be tested and an engineering report forwarded when tests are completed.

B. S. Corbett

(B. S. Corbett),
Flying Officer,
D.I.

BSC/AR

COPY

THE DEHAVILLAND AIRCRAFT OF CANADA
LIMITED

MOLSON

December 16, 1941.

Our Ref: WHJ/AC 19/1

Royal Canadian Air Force,
#12 Technical Detachment,
Cawthra Square,
Toronto, Ontario.

Dear Sirs: Attention F/O R Beale

As per our telephone conversation, the enclosed copies of four letters between ourselves and the Chief of the Air Staff, are all the information that we have at present on weights of the Menasco Moth Radio Trainer.

The following list gives the serial and the tare weights of ten of our Tiger Moth preliminary trainers.

Aircraft	Tare Weight
5994	1270
5995	1269
5996	1272
5997	1268
5998	1272
5999	1267
1100	1272
1101	1269
1102	1272
1103	1271

Hoping that this information will be of some use to you.

Yours very truly,

THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED

Wm. H. Jackson
Chief Draughtsman.

FILE No. 33-6-3

Ref: H,Q. 1021-20-13 (AMAE:DAI)
Dated December 13th.

1021-20-19
DAI

ROYAL CANADIAN AIR FORCE

MOLSON

December 18th, 1941.

ATTENTION: A.M.A.E. - D.AI.

The Secretary,
Department of National Defence for Air,
Jackson Building,
OTTAWA, Ontario.

Menasco Moth II - Tare Weight

1. Enclosed please find correspondence between Air Force Headquarters and the DeHavilland Aircraft concerning the overloading of the Menasco Moth II. This shows that Air Force Headquarters was aware that the loading went as high as 1922 pounds.

2. In regards to paragraph 2 of your letter, enclosed is a copy of a letter from DeHavilland Aircraft showing the tare weights of ten Tiger Moth I aircraft recently completed at this Contractors'. It will be noted that this tare weight is in the neighborhood of 1270 pounds. This is an increase in weight from the original average of about 1215 pounds. This is due to the following additions:

Battery	45 lbs.
Night Flying Equip.....	10 lbs.
Control Box Cover	Additional 2 lbs.
Medical Kit	
Aileron Control Shields.	

In addition the aircraft are now being covered with cotton fabric instead of linen. This fabric absorbes more dope, and it is estimated that there is an increase of two or three pounds in this instance.

R. Beale
(R. Beale) Flying Officer,
for Commanding Officer,
No. 12 (Technical) Detachment, RCAF.,
Cawthra Square Building, Toronto.

CIA 2

D/DAD. 2.
For your necessary information and action Thks.
Aw 7/12-41
J. DAI 22.12.41

D/DAI.

1. We wrote to #12 about the TARE WEIGHT and not about GROSS weight as a ski plane. If the Tare weight is not under control then the Gross weight estimates + calculations are equally incorrect.
2. #12 have admitted that the Menasco II's are overweight and should be told that they have incurred our displeasure.
3. #12 now admit that they are not complying with Spec Air-11-2 on present production (see Encl. paras 35 + 36) and should take immediate action to comply with it.

D/DAD 23/12.

195
120
920
880
9.50

5.25

50

195

67
3.5
3.55

1.95
1.20
8.90
19.50

48.50
Entire Money

19
5
5

43.25

10.75

2550
1075
890
1335
1150
41

6.00
19.50
10.75
8.90
3.35

39
19.50
58.50

2550
1075
3625
890
4515
335
48.50

23.35
2211
4850
58.50

Montreal, Quebec. He was able to build his first two monoplanes on the premises and presumably used the available facilities to his advantage. Though the first two biplanes were similar in configuration, they differed in size. The first was smaller and lower powered. Both were constant chord monoplanes with an uncovered fuselage and with a complete tail assembly including fin and rudder, stabilizer and elevators. The first variant was powered with a 2-cylinder Detroit Aero engine of 25 hp, soon to be replaced with a 3-cylinder, fan-type Vial engine of 35 hp. The first machine was the first powered aircraft to fly in the Montreal area, when Reid became airborne on 7 June 1911.

Reid's second machine was powered with a 5-cylinder, radial Viale engine of 55 hp, and first flew in late August 1911. It performed well and it was flown often on the field currently used by Canadair. Reid's third monoplane was the most sophisticated of the group and had the forward fuselage, behind the engine, covered with aluminum sheet. The wing tips were rounded and the landing gear was improved and with the 55 hp Viale engine it first flew in August 1913. It continued to perform well until destroyed by a wind storm in October 1913.

Herman E. Clarke is credited with building an Avro-Type biplane at Vancouver, British Columbia in 1912-13. This aircraft was underpowered and put in storage where it was subsequently burned. He is supposed to have built a small monoplane of his own design, powered with a 3-cylinder Humber engine of 30 hp. which flew well

QUALITY STONE GARDEN DECOR

- ☐ HAND-CRAFTED CAST STONE
- ☐ DURABLE FINISH
- ☐ OUTDOOR OR INDOOR USE

ORNEMENTS DE JARDIN EN PIERRE DE BÉTON DE QUALITÉ

- ☐ PIERRE DE BÉTON MOULÉE À LA MAIN
- ☐ FINI RÉSISTANT
- ☐ POUR L'EXTÉRIEUR OU L'INTÉRIEUR

DECORACIÓN DE PIEDRA DE ALTA CALIDAD PARA JARDÍN

- ☐ PIEDRA MOLDEADA A MAMO
- ☐ ACABADO DURADERO
- ☐ PARA SU USO EN EL INTERIOR O EN EL EXTERIOR

CORINTHIAN BIRD BTH 2PC
ITEM #2280 OS

0 40209 02981 5

PRICE 84.99

This quality cast stone garden decor item is designed for both outdoor and indoor use. As with any concrete item, however, it must be protected from ice. Do not allow this item to stand in ice; do not allow ice to form in any area where water may collect. Fountain bowls and shells, birdbath tops, and planter interiors must be drained and covered if left outdoors during winter and periods of freeze in order to avoid cracking and other damage.

Cet ornement de jardin en pierre de béton moulé, convient aussi bien à l'extérieur qu' à l'intérieur. Cependant, comme pour tout article en béton, il faut le protéger du gel. Ne pas laisser la glace se former autour de cet objet; ne pas laisser l'eau s'accumuler à l'intérieur, à l'extérieur et dans les interstices où elle risquerait de geler. Les bassins et réservoirs des fontaines, les abreuvoirs d'oiseaux et l'intérieur des bacs à fleurs doivent être vidés complètement et couverts s'ils séjournent à l'extérieur pendant l'hiver ou pendant les périodes de gel, afin d'éviter les fissures et autres dommages.

Este artículo de decoración de piedra moldeada está diseñado para su uso en el interior y en el exterior. No obstante, al igual que con cualquier artículo de cemento, debe ser protegido del hielo. No permita que este artículo sea situado en hielo; no permita que el hielo se acumule en ningún área donde se pueda concentrar el agua. Con el fin de evitar grietas y otro tipo de daños al artículo, los cuencos y las conchas para fuentes, las cazoletas de baño para pájaros y los maceteros para interior deberán ser drenados y cubiertos si se dejan en el exterior durante el invierno y durante periodos de heladas.

19 Sept 01

Red White Blue

Yellow

Brad Ford

Alex H. Trotter

tip floats and first flown on 1
t interest in the purchase of an
prospects, Baddeck No.2 was not

raft were completed in Canada in
irsts" which were recorded during
sing that a lack of volume of new
oming.

projects in Canada, two were
y and two were private ventures,
.

was given an order to build the
ene Hubbard II of Boston, Mass.,
se maiden name was Hubbard) The
.A.C. is questionable, but the
nced for the period. The fuselage
abric covered (mainsook), with a
within the fuselage near its
tractor propeller through a chain
shoulder-mounted monoplane wing
th surfaces. Ailerons were hinged
on both sides and were quite

Detail of DH Tigor Moths in RAF Sevice 1939-1945

FBA-2

ighter

Bay Super-V

Saunders Cheetah

td., DHC-5 Buffalo

td., DHC-6 Twin Otter

17 Sept 01

P.O Box 2131 St Catharines
L2R 7S2

800

Wants copies of
2 new book manuscripts

Typing himself to get CMA &
RCAF Sqn Histories

All the above talking with
Simon Kooter.

Vanwell Publishing Ltd.
St. Catharines, Ont

May be in re-runs

Missing Summaries

Tony Stochin / 5 Sept 01

10

13 Van Well Publishing Ltd

14

18

20

47

54

call { Simon Kooter 830-430

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Sea Lords in South East Asia.

Station Dis. Banshee for

disposal TW 46

Remaining 80 CF-18

for Stachiw

June 24/99

Do computer copies
of my Liberator pictures

Liberators Africa
Liberators India
Liberators 1945

Position of Rounds
And size + style
of Individual letters

Type - Type	Numéro de série - Serial Number	Numéro constructeur - Manufacturer's Number	Porté a l'effectif - Taken on Strength	Raye des contro - Struc off Streng
Beechcraft Expeditor 3T	HB 112	5840	22.12.43	24.3.
Beechcraft Expeditor 3T	HB 113	5844	6.1.44	24.3.
Beechcraft Expeditor 3 T	HB 114	5848	14.1.44	1.2.
Beechcraft Expeditor 3T	HB 115	5852	4.1.44	Acti
Beechcraft Expeditor 3 T	HB 116	5854	22.12.43	19.3.
Beechcraft Expeditor 3 T	HB 117	5856	6.1.44	19.3.
Beechcraft Expeditor 3 NM	HB 118	5858	6.1.44	21.1.
Beechcraft Expeditor 3 T	HB 119	5860	6.1.44	5.11.
Beechcraft Expeditor 3 T	HB 120	5864	6.1.44	3.3.
Beechcraft Expeditor 3 T	HB 121	5866	6.1.44	9.11.
Beechcraft Expeditor 3T	HB 122	5868	6.1.44	19.3.
Beechcraft Expeditor 3T	HB 123	5870	6.1.44	5.4.
Beechcraft Expeditor 3 T	HB 124	5872	6.1.44	16.10.
Beechcraft Expeditor 3T	HB 125	5874	6.1.44	14.6.
Beechcraft Expeditor 3 T	HB 126	5876	6.1.44	Activ
Beechcraft Expeditor 3 T	HB 127	5712	16.2.44	31.8.
Beechcraft Expeditor 3 T	HB129	5756	18.2.44	31.8.
Beechcraft Expeditor 3 T	HB 130	5996	11.2.44	Activ
Beechcraft Expeditor 3T	HB 131	5998	18.2.44	Activ
Beechcraft Expeditor 3 T	HB 134	5978	18.2.44	22.8.
Beechcraft Expeditor 3T	HB 135	5980	2.2.44	22.1.
Beechcraft Expeditor 3 T	HB 136	5982	18.2.44	Activ
Beechcraft Expeditor 3 T	HB 137	5984	3.2.44	2.8.
Beechcraft Expeditor 3T	HB 138	5986	18.2.44	Activ
Beechcraft Expeditor 3 T	HE 139	5988	16.2.44	26.4.
Beechcraft Expeditor 3T	HB 140	5990	10.2.44	19.3.
Beechcraft Expeditor 3T	HB 141	6002	18.2.44	Activ
Beechcraft Expeditor 3 T	HB 142	5716	10.2.44	19.3.
Beechcraft Expeditor 3T	HB143	5736	18.2.44	21.2.
Beechcraft Expeditor 3 T	HB 144	5744	18.2.44	Acti
Beechcraft Expeditor 3 T	HB 145	5748	10.2.44	21.7.
Beechcraft Expeditor 3 T	HB 146	5752	18.2.44	3.8

New 823-4904 home

Tony Stachiw

work

~~737-2712~~

991-9758

~~Ex-Wife~~

need

Shaw

836-5533

Joni Attachie

2119

991-

office number

please

I'll call you

afternoon

Donald Kennedy

Married on

Jerry Kennedy
b. 17 October 1937
d.

Married on

Jeff Kennedy
b.
d.

Cindy Kennedy
b.
d.

KB 726

VR-A 419 San

Ja-88

Franc Book P.55

T.L 60L

A9 Mynaski's

M96 Lianc.

NAM

Tony Stachiw

office 991-~~9738~~ 2119

Home. 823-4904

25 June 99 (New numbers)

Thursday

Call Stachiw

re Lib & explain

why Ralph is tied

up.

Toni Stachiw

~~991-9738~~

9912119

Ralph Leonardo

745-1277

Doing a painting of Menarski's
Lancaster's last flight * hopes
to discover ① MK No. of Junkers 88
② Serial number +
Sqn. Markings of enemy

John Griffin

Last Lib flown on ops at 200 Sqn
(preferably Mk VI) for Tony Stachiw
to be model.

May 24, 1944 EV818 Escort VI
Endiz
Yenang Yaung
11:25 hrs

Mar 18 To Mar. 30/44 BZ868 V
Vanduvre WH to
Madras India

4861

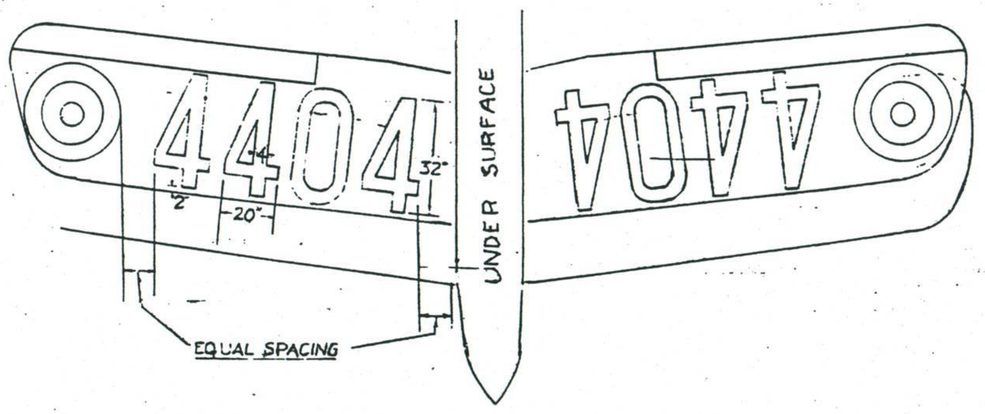
~~4 3/4" WIDE~~ 8" HIGH

1 1/8" THICK

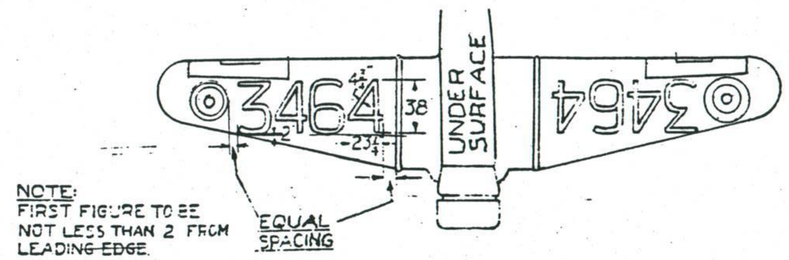
6 7 3/4" HI
5" WIDE

8 TOP LOOK 4 1/2" WIDE
BOTTOM L 5 1/4" L
1 L 1. 1/4" THICK

4 BOTTOM STROKE 5 3/4" WIDD

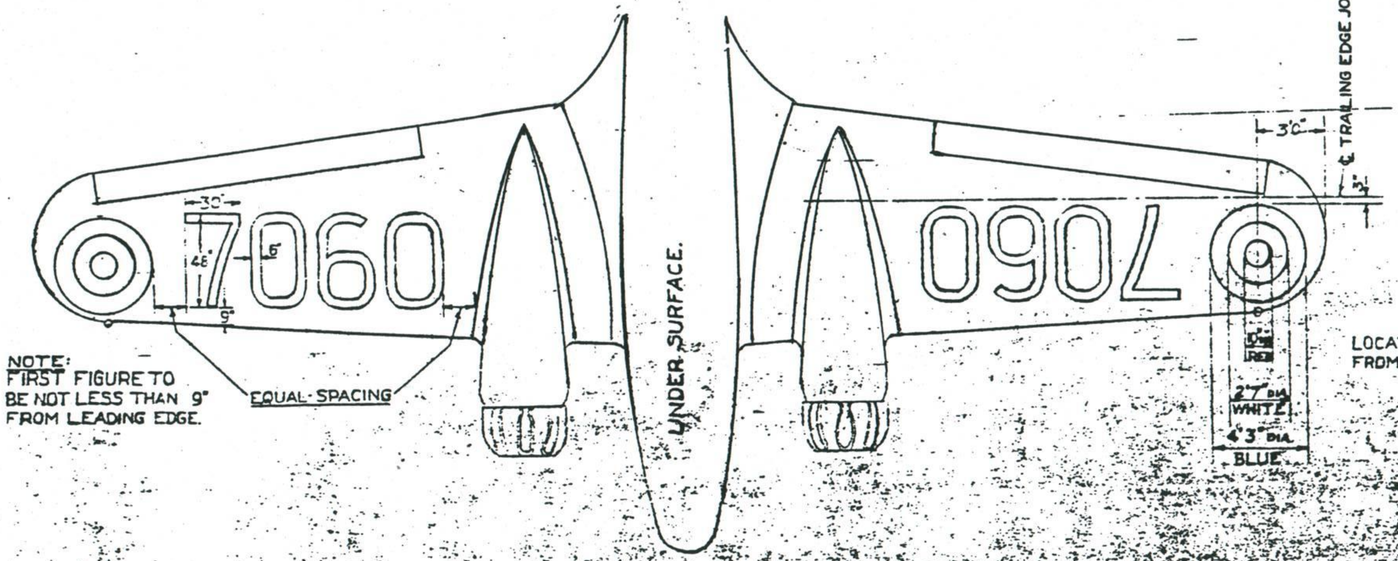


TIGER MOTH



NOTE:
FIRST FIGURE TO BE NOT LESS THAN 2 FROM LEADING EDGE.

YALE. HARVARD I & II



NOTE:
FIRST FIGURE TO BE NOT LESS THAN 9" FROM LEADING EDGE.

EQUAL SPACING

ANSON

NOTE:
THE NUMERALS ON THE WINGS ARE TO BE BLACK ON YELLOW OR ALUMINIUM UNDERSURFACES OR WHITE ON BLACK UNDERSURFACES.

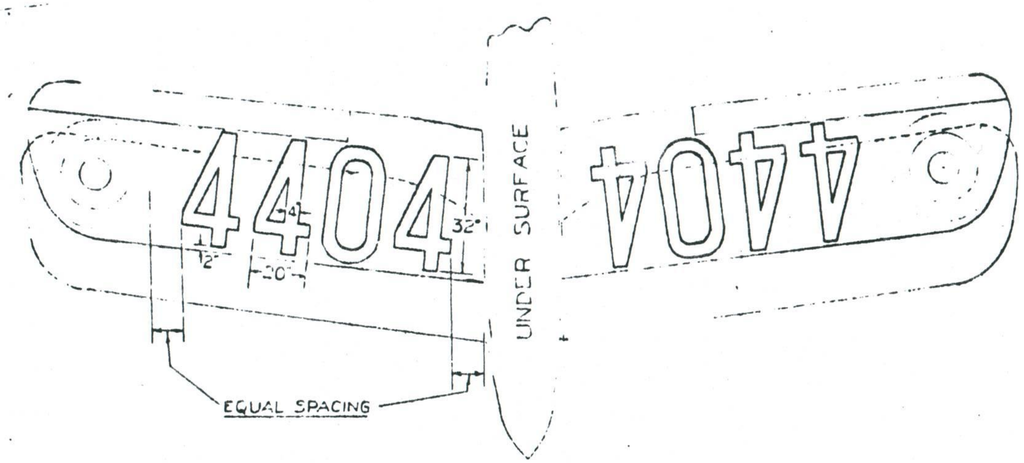
LOCATION OF ROUNDEL OBTAINED FROM A.V. ROE DRAWING Z.965 SHT. L

BM

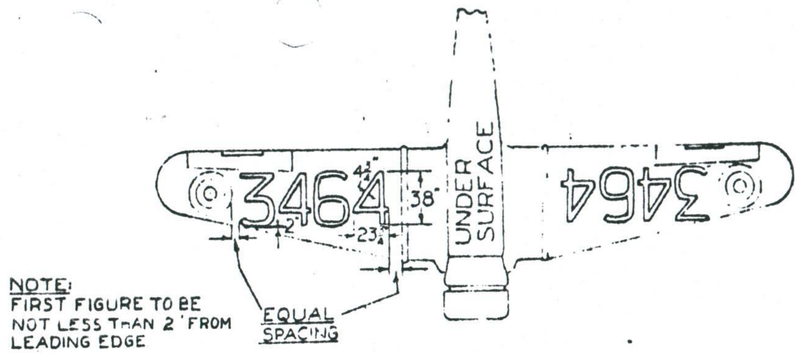
ROYAL CANADIAN AIR FORCE

DATE: MAY 8TH, 1941	SCALE: NOT TO SCALE
TIGER MOTH, HARVARD I & II	
ANSON & YALE	
REGISTRATION NUMBERS FOR UNDERSURFACES OF WING	
DRAWN BY: E.O.H.	CHECKED BY: A.T.
TRACED BY:	APPROVED BY:

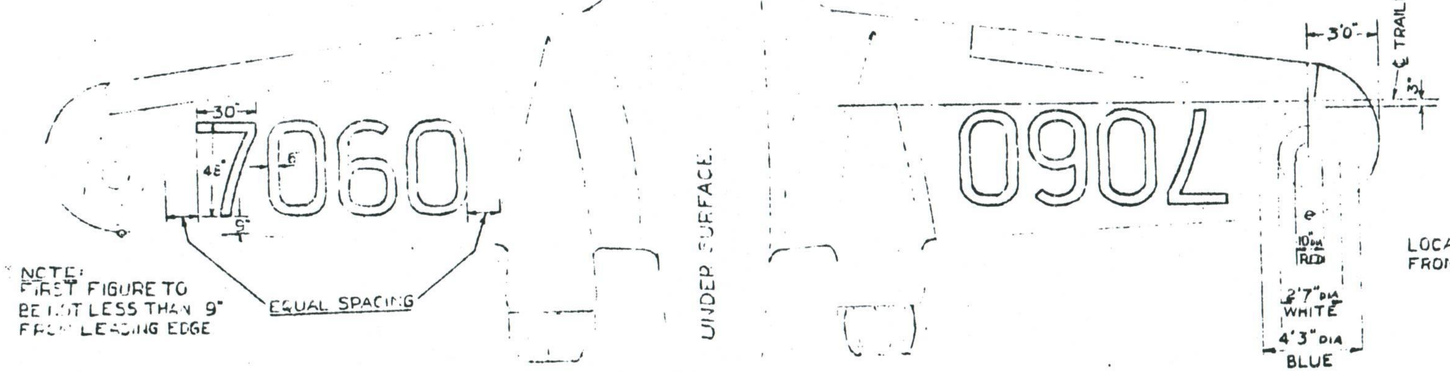
R.C.A.F. 3508



TIGER MOTH



YALE, HARVARD I & II



ANSON

NOTE:
THE NUMERALS ON THE WINGS ARE
TO BE BLACK ON YELLOW OR ALUMINIUM
UNDERSURFACES OR WHITE ON BLACK UNDERSURFACES

LOCATION OF ROUNDEL OBTAINED
FROM A.V. ROE DRAWING Z 965 SHT. 1

BM

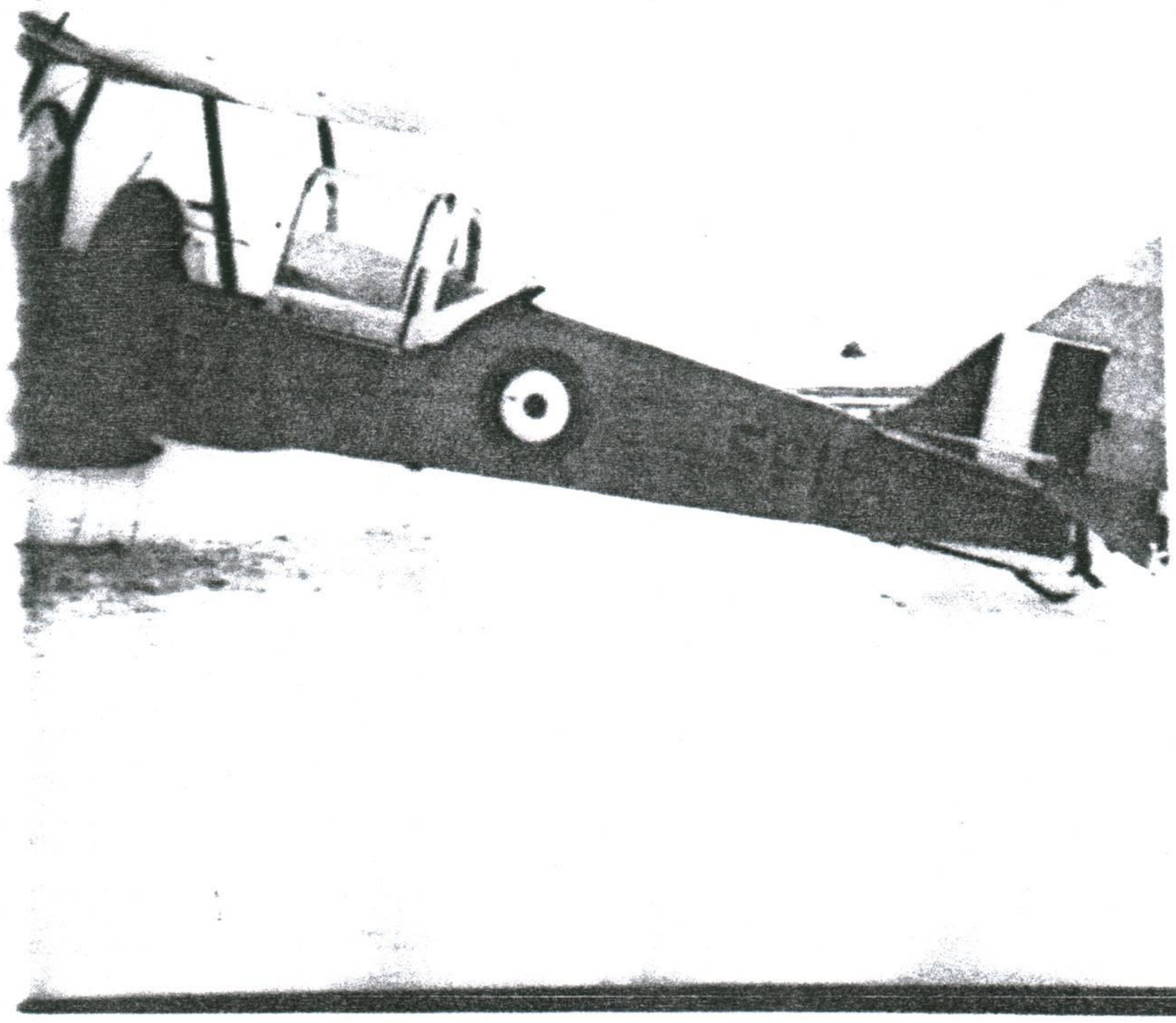
ROYAL CANADIAN AIR FORCE

DATE: MAY 5TH 1941	SCALE: NOT TO SCALE
DRAWN BY: E.G.H.	CHECKED BY: [illegible]
TRACED BY:	APPROVED BY: [illegible]

TIGER MOTH, HARVARD I & II, ANSON & YALE.

REGISTRATION NUMBERS FOR UNDERSURFACES OF WINGS

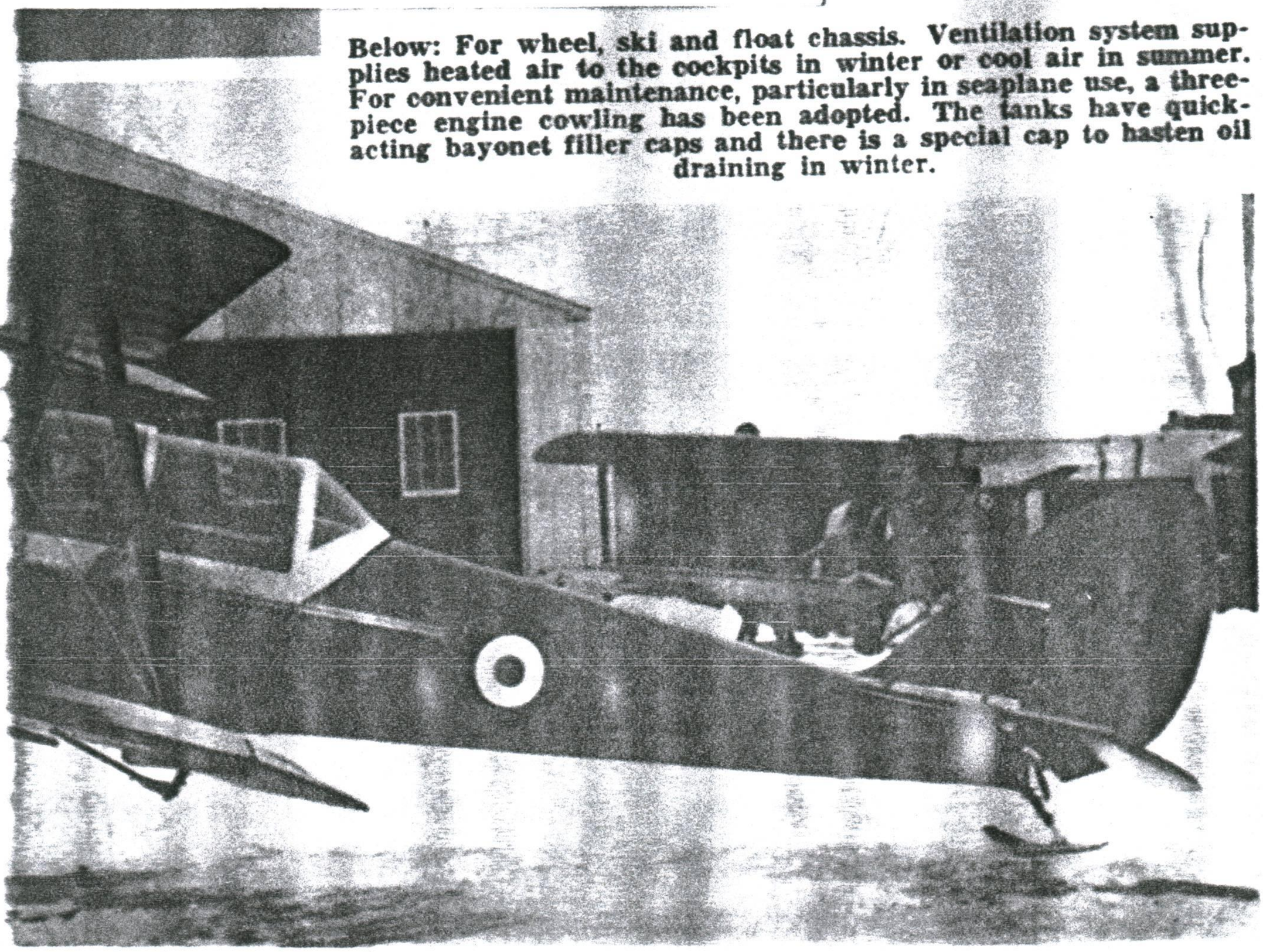
R.C.A.F. 3508





r for all primary and blind fly-
vith moulded rubber pads for
of minor accident.

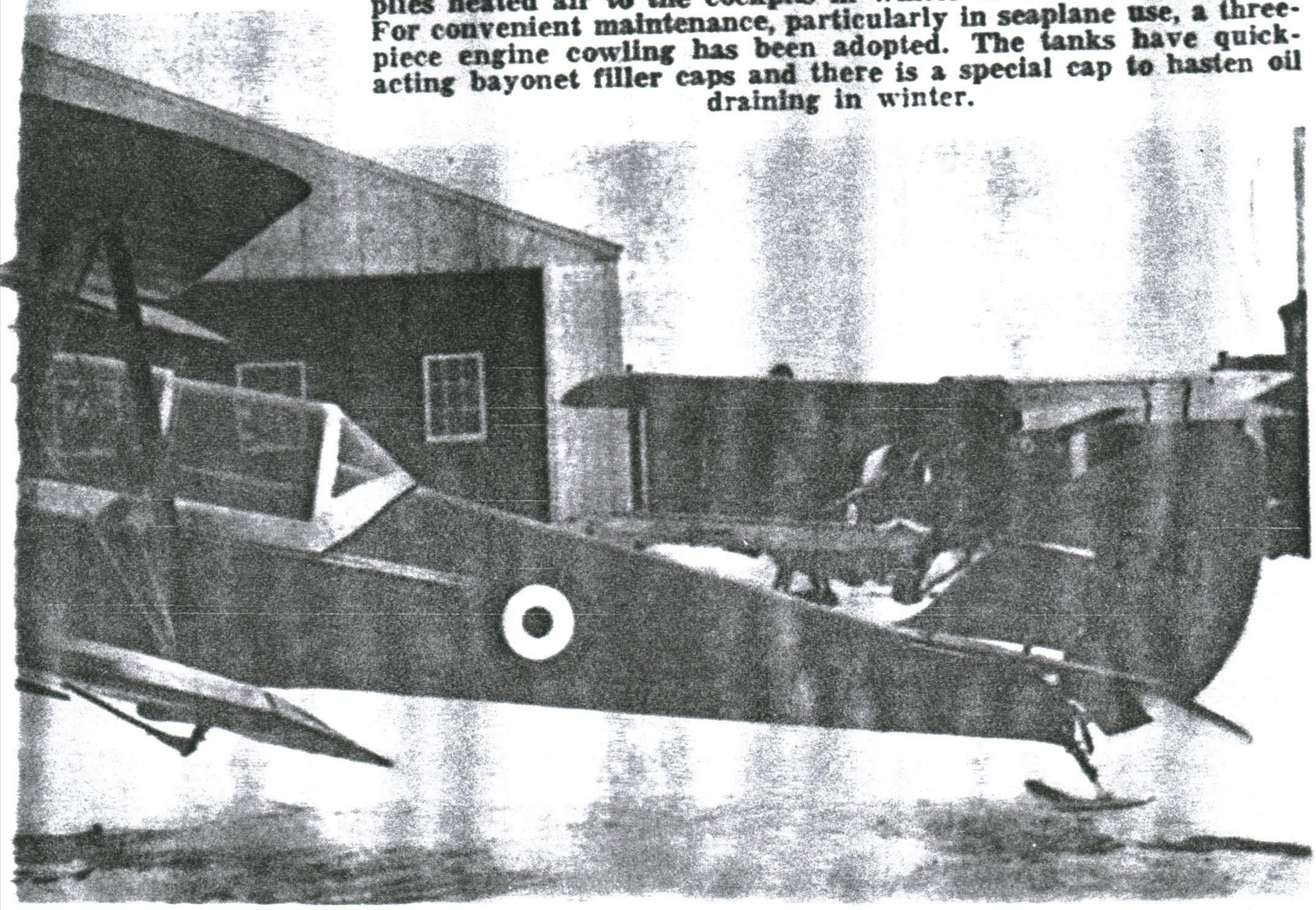
Below: For wheel, ski and float chassis. Ventilation system supplies heated air to the cockpits in winter or cool air in summer. For convenient maintenance, particularly in seaplane use, a three-piece engine cowling has been adopted. The tanks have quick-acting bayonet filler caps and there is a special cap to hasten oil draining in winter.

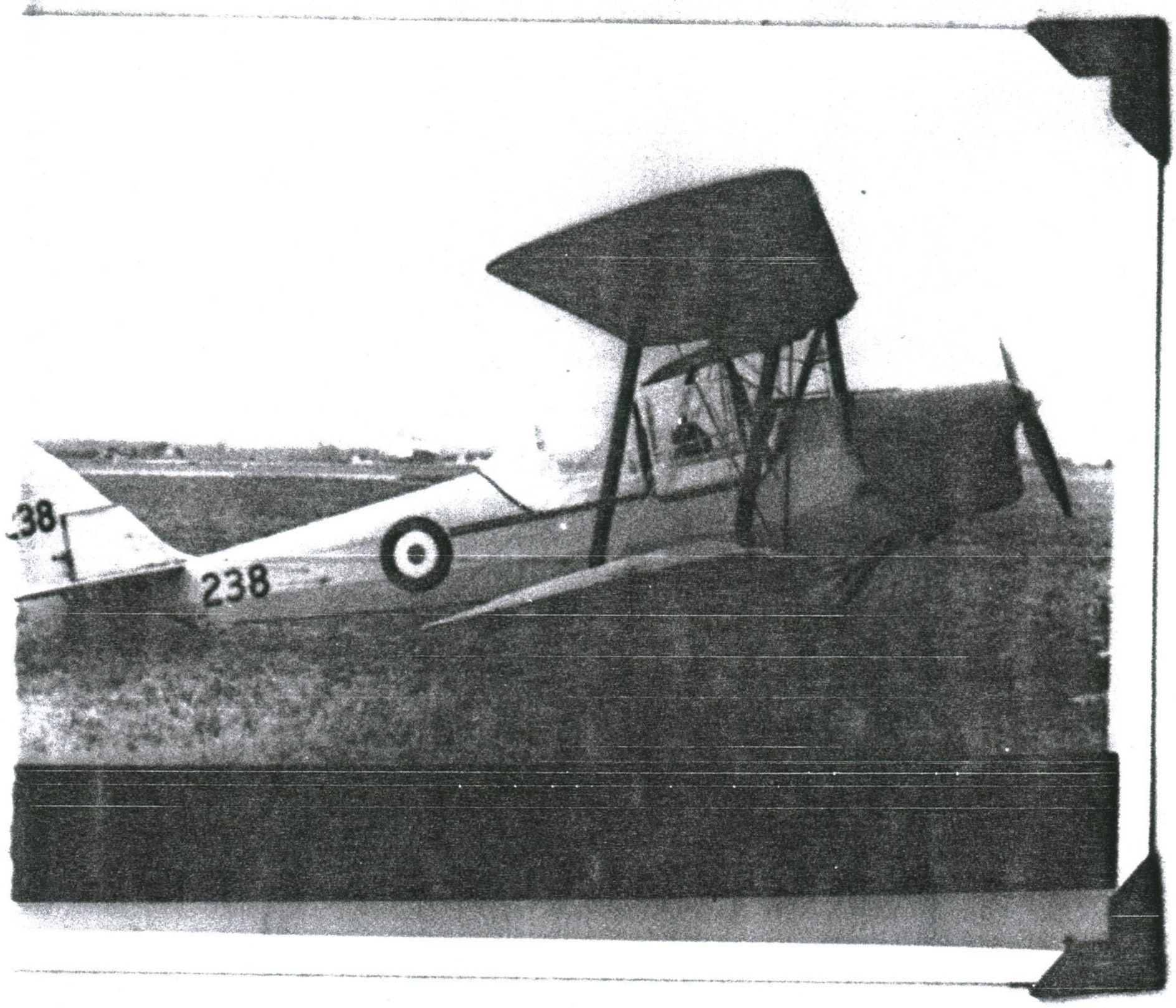


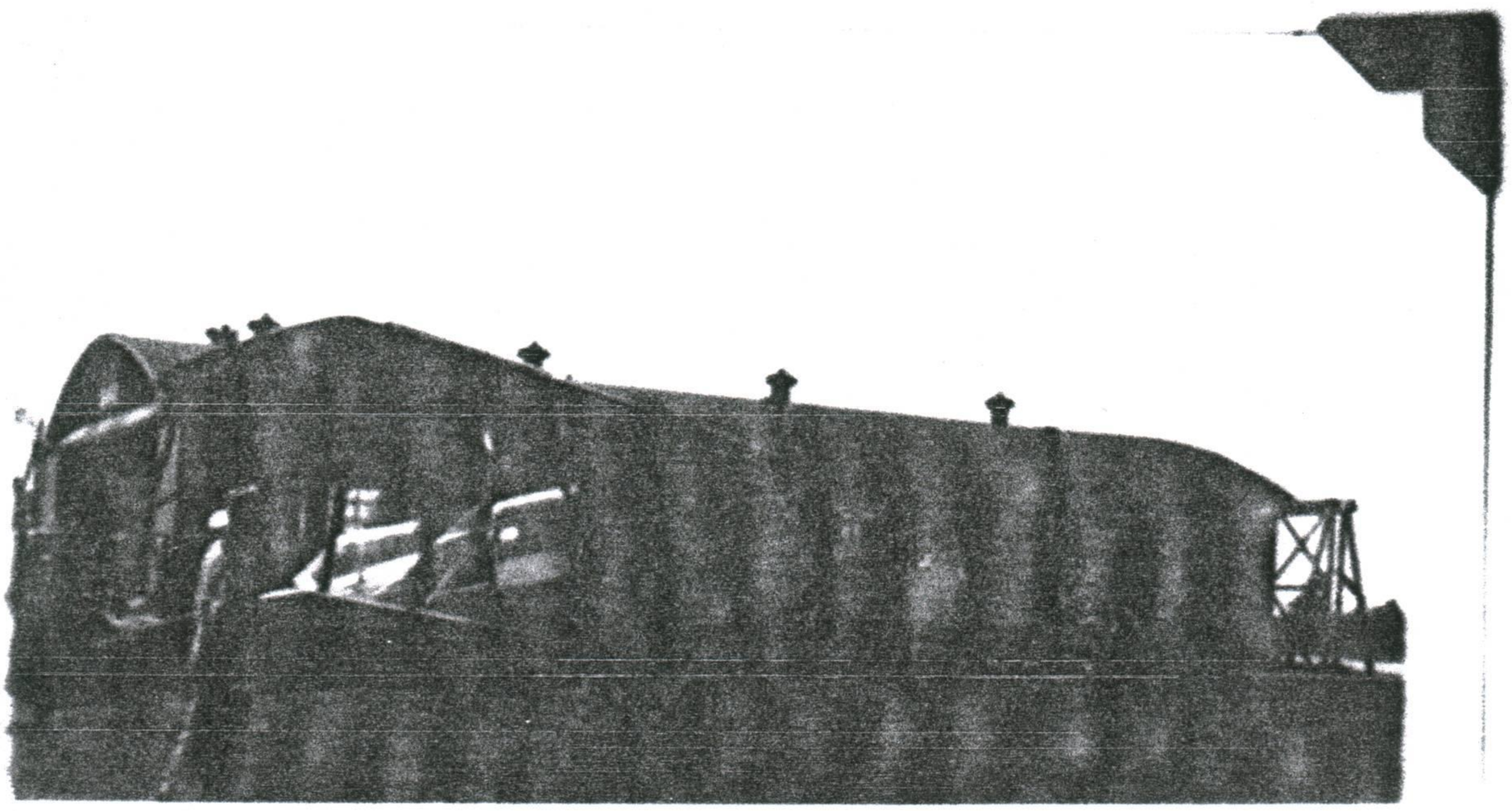


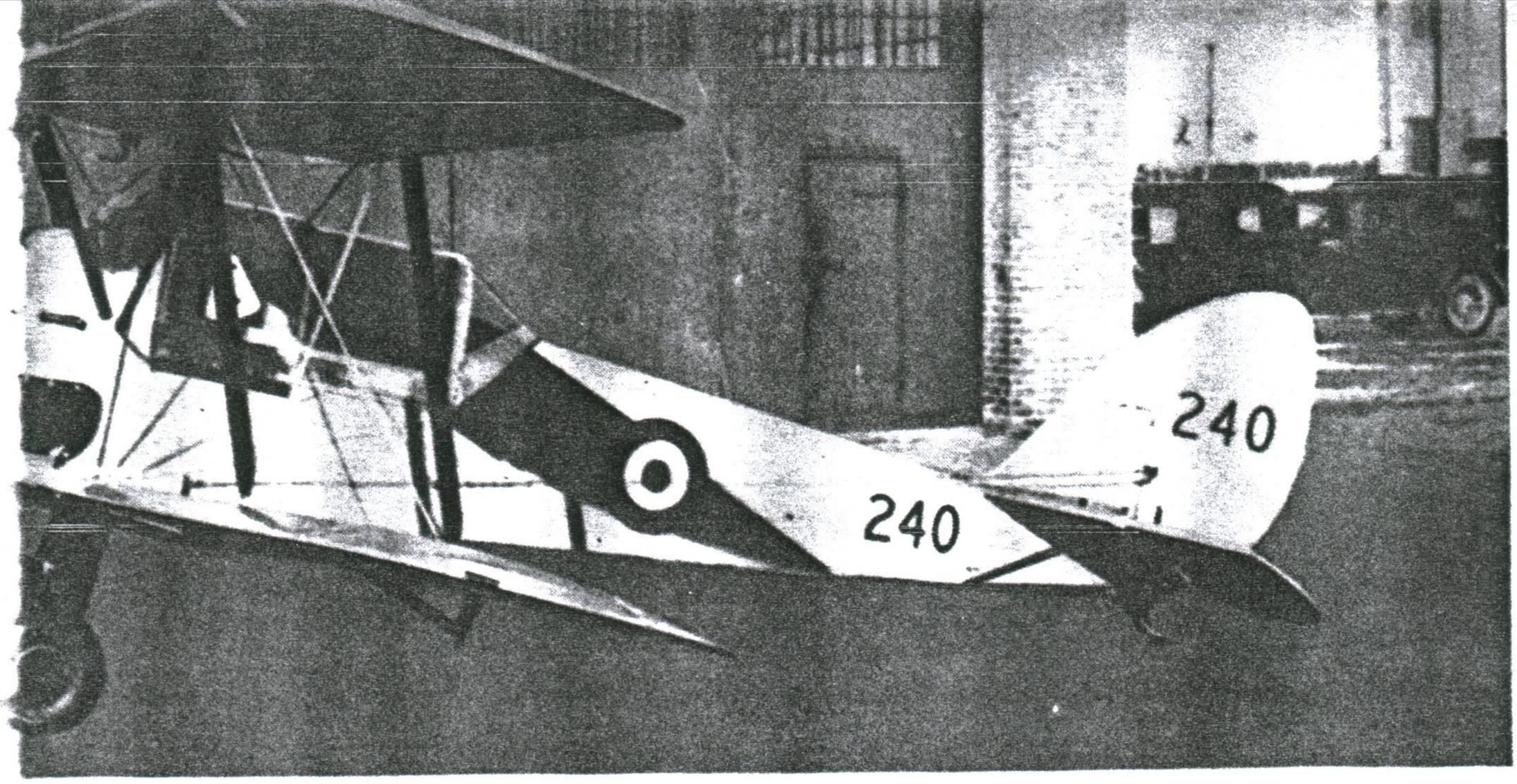
Above: The instrument panels cater for all primary and blind flying instruction and are covered with moulded rubber pads for protection in the case of minor accident.

Below: For wheel, ski and float chassis. Ventilation system supplies heated air to the cockpits in winter or cool air in summer. For convenient maintenance, particularly in seaplane use, a three-piece engine cowling has been adopted. The tanks have quick-acting bayonet filler caps and there is a special cap to hasten oil draining in winter.




238





TIGER MOTH D.H.82A.

3 ft. 11	in.	7,32	m.
9 ft. 4	in.	8,95	m.
8 ft. 9.5	in.	2,71	m.
5 ft. 3	in.	1,6	m.

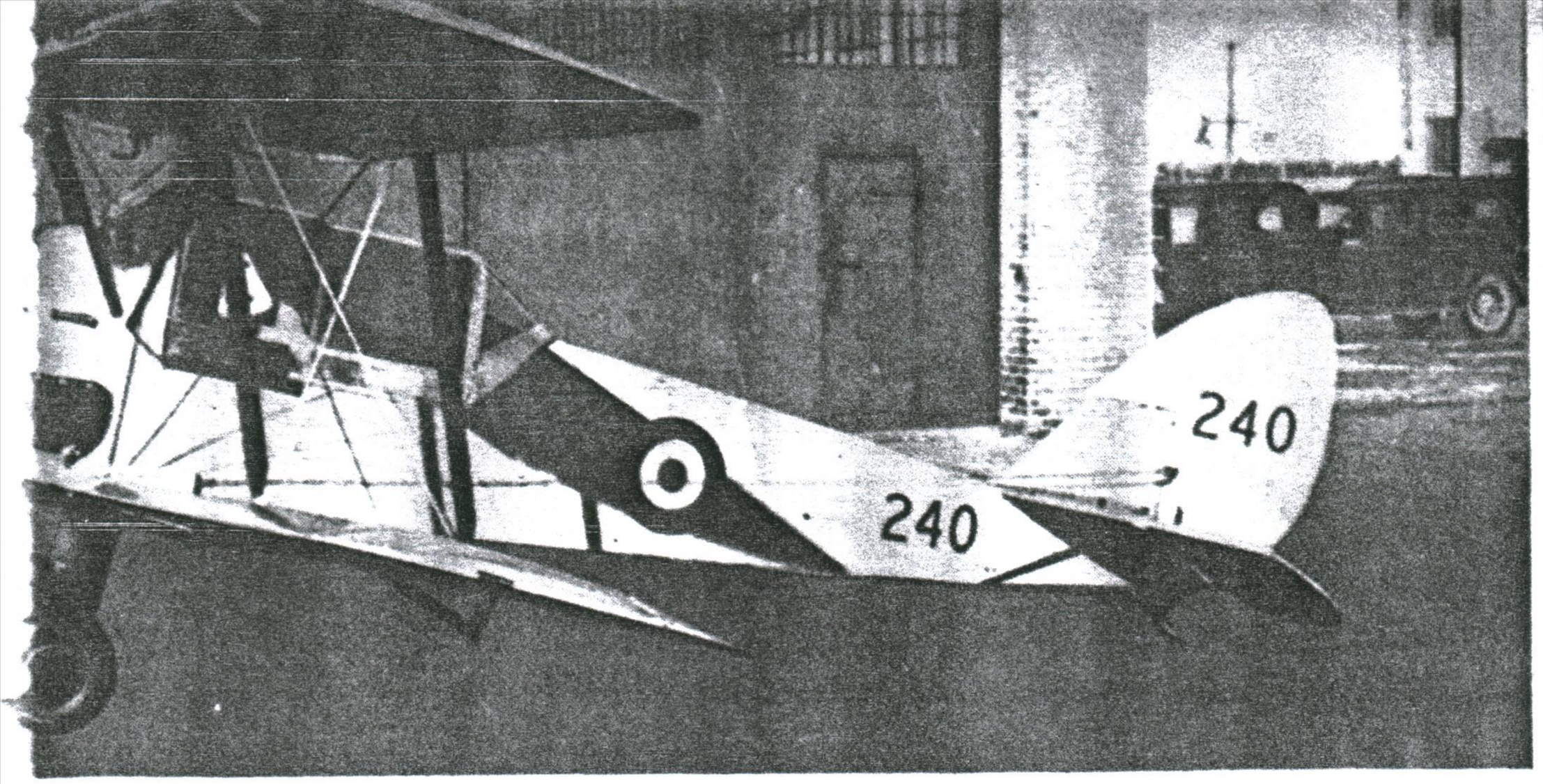
Engine—Gipsy Major Series 1, 130 h.p.
Maximum All-up Weight (aerobatics) ..... 1770 lb.
Maximum All-up Weight (normal) ..... 1825 lb.

	Normal Weight (1,650 lb.)	Maximum Weight (1,825 lb.)
.....	110 m.p.h.	109 m.p.h.
.....	94 m.p.h.	93 m.p.h.
.....	5.9 gall. hr.	5.9 gall. hr.
.....	302 miles	300 miles
.....	43 m.p.h.	46 m.p.h.
.....	119 yds.	156 yds.
.....	122 yds.	133 yds.
.....	798 ft./min.	673 ft. min.
.....	7.5 min.	9 min.
.....	15,800 ft.	13,600 ft.



r, manufactured at Downsview, Ont. (near Toronto) by the de Havilland Aircraft of Canada Limited. Twenty-five of these aircraft were recently completed for delivery to the R.C.A.F.



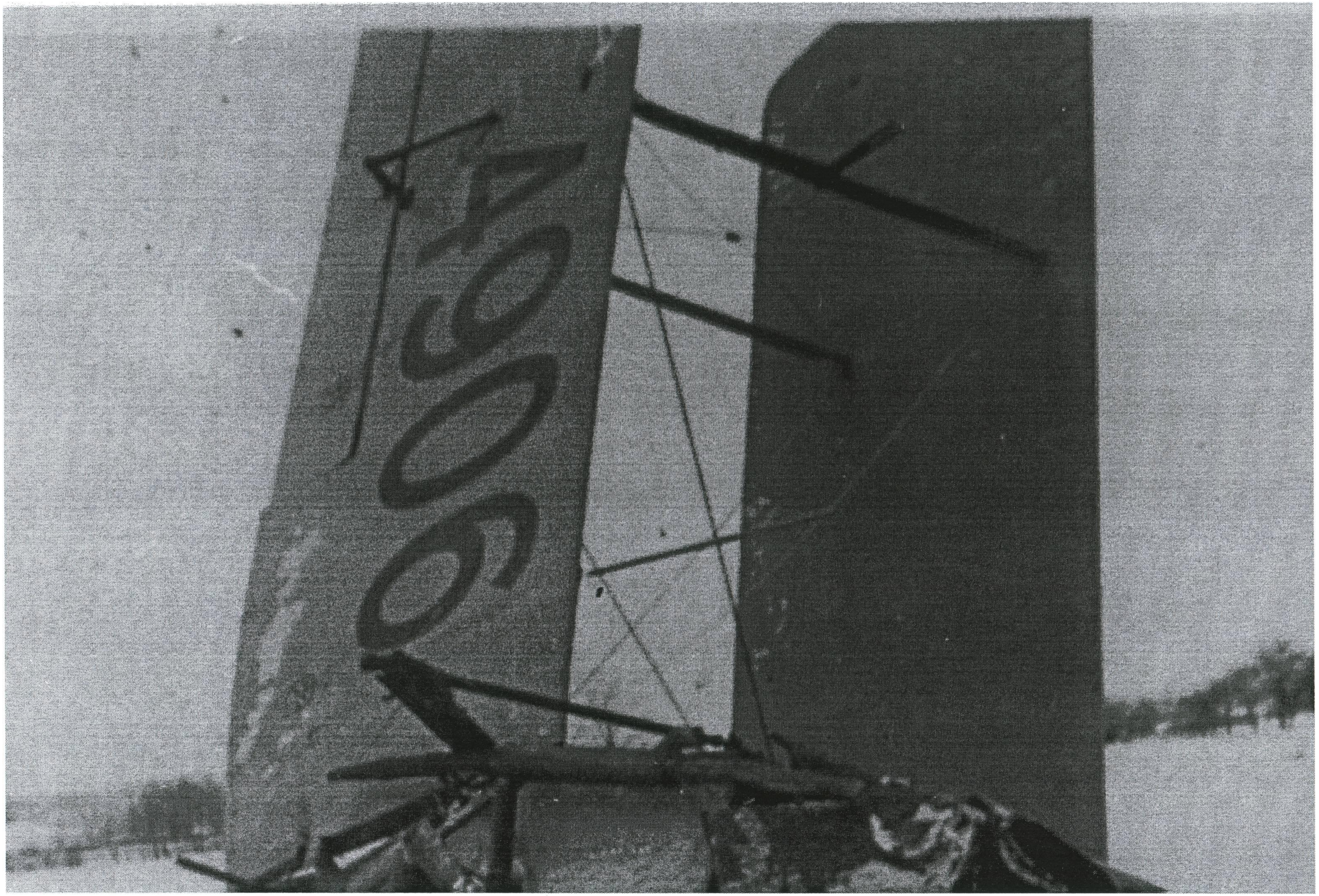


TIGER MOTH D.H.82A.

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5 ft. 3	in.	1,6 m.	

	Normal Weight (1,650 lb.)	Maximum Weight (1,825 lb.)
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.....	5.9 gall./hr.	5.9 gall. hr.
.....	302 miles	300 miles
.....	43 m.p.h.	46 m.p.h.
.....	119 yds.	156 yds.
.....	122 yds.	133 yds.
.....	798 ft. min.	673 ft. min.
.....	7.5 min.	9 min.
.....	15,800 ft.	13,600 ft.






4197
4197
4197

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