3rd Edition

A.P. 1721H—P.N.

PILOT'S NOTES

FOR

BEAUFIGHTER TFX

TWO HERCULES XVII OR XVIII ENGINES

PREPARED BY DIRECTION OF THE MINISTER OF SUPPLY

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PROMULGATED BY ORDER OF THE AIR COUNCIL

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NOTES TO USERS

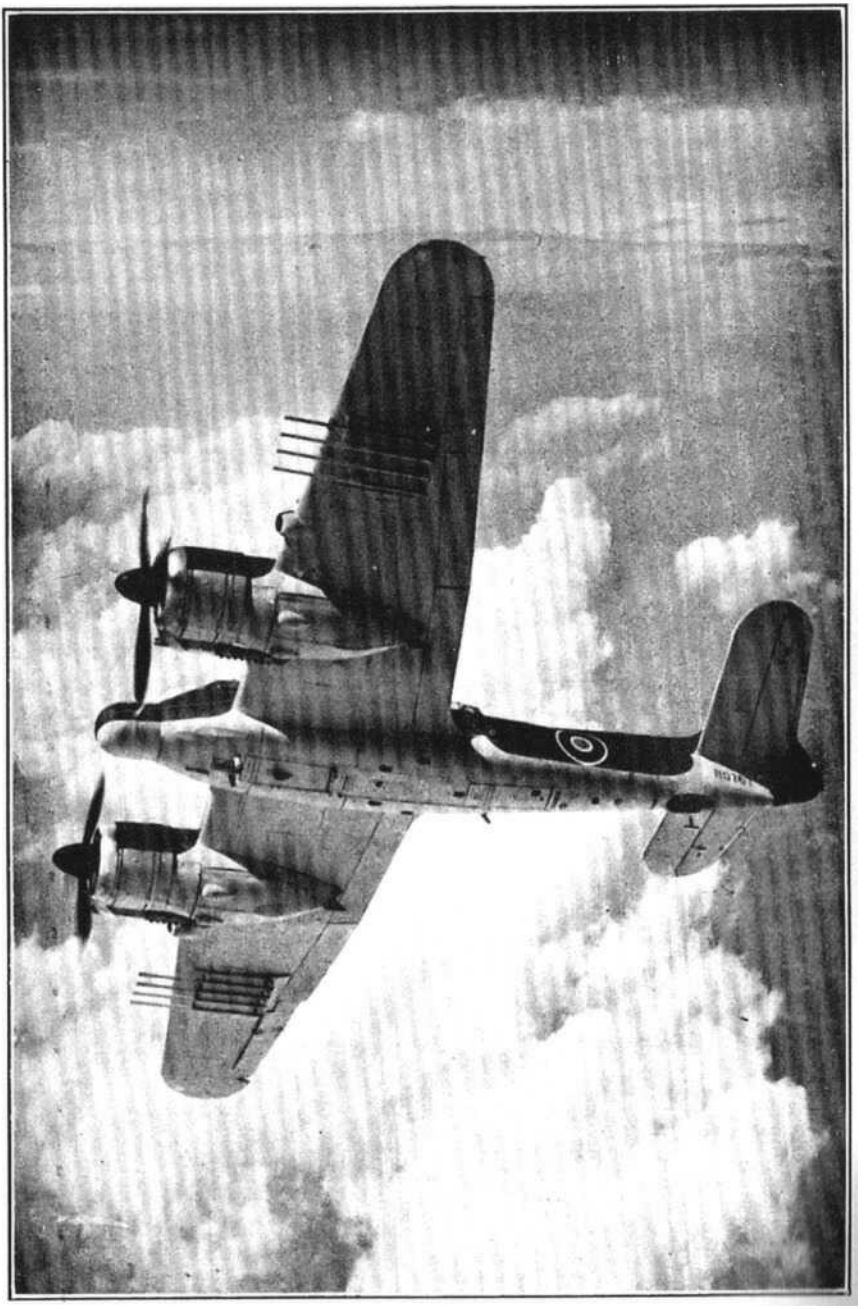
THIS publication is divided into five parts : Descriptive, Handling, Operating Data, Emergencies, and Illustrations. Part I gives only a brief description of the controls with which the pilot should be acquainted.

These Notes are complementary to A.P. 2095 Pilot's Notes General and assume a thorough knowledge of its contents. All pilots should be in possession of a copy of A.P. 2095 (see A.M.O. A93/43).

Words in capital letters indicate the actual markings on the controls concerned.

Additional copies may be obtained by the Station Publications Officer by application on Form 294A, in duplicate, to Command headquarters for onward transmission to A.P.F.S., 81 Fulham Road, S.W.3 (see A.M.O. A1114/44). The number of this publication must be quoted in full—A.P. 1721H—P.N.

Comments and suggestions should be forwarded through the usual channels to the Air Ministry (D.T.F.).



BEAUFIGHTER TFX

BEAUFIGHTER TF MK. X

PILOT'S NOTES

3rd Edition

These notes supersede all previous issues which covered this mark of aircraft

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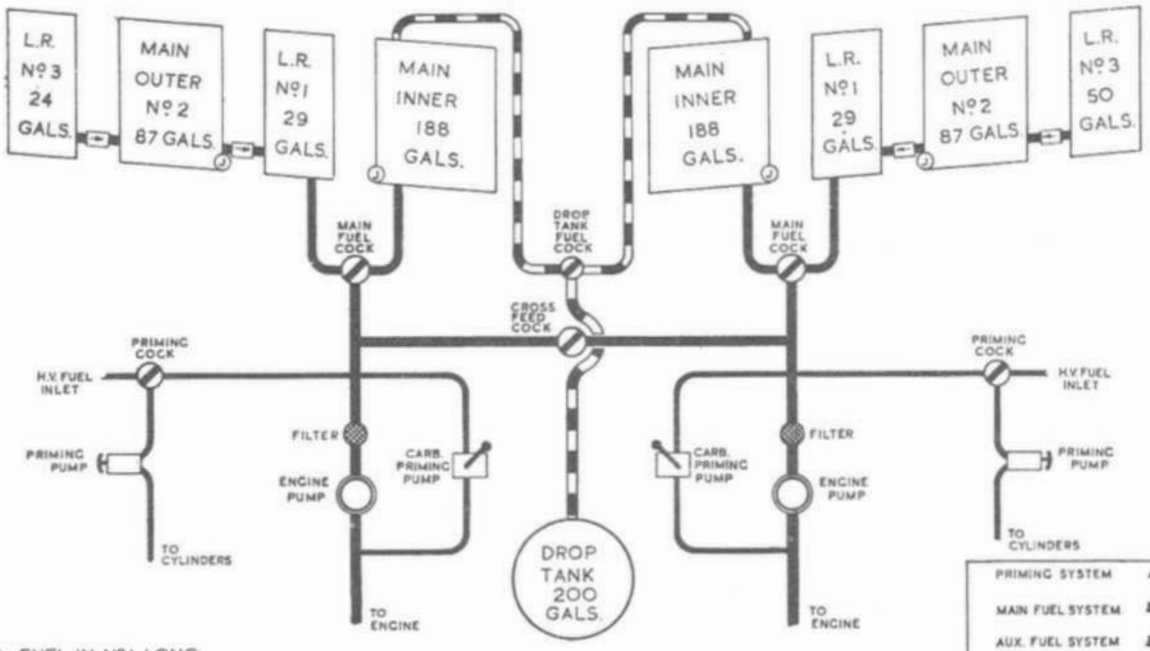


NOTE:- FUEL IN Nº1 LONG RANGE TANKS IS NOT JETTISONABLE.

SIMPLIFIED FUEL SYSTEM DIAGRAM

PART I

DESCRIPTIVE

INTRODUCTION

The Beaufighter T.F. Mk. X is a long-range low-altitude torpedo-carrying fighter. It is powered by two Hercules XVII or XVIII engines driving three-bladed fully feathering Hydromatic propellers.
A variety of external stores may be carried.

NOTE.—Unless otherwise specified these notes apply only to aircraft which incorporate modifications T.361, T.375 and T.376, and which are fitted with " paddle bladed " propellers.

FUEL AND OIL SYSTEMS

1. **Fuel tanks**

(i) Fuel is carried in four main self-sealing tanks, two in each wing.

(ii) Later aircraft have four additional self-sealing tanks which, in effect, form enlarged outer main tanks. Aircraft which have these additional tanks do not carry the wing machine guns. The tanks in each wing are interconnected by a cross feed pipe and cock.

(iii) A 200-gallon non-selfsealing drop tank can be carried on the torpedo rack. The tank is pressurised and the flow of fuel from it is controlled by a cock (32), marked ON—DROP TANK—OFF, which is fitted below the main fuel cocks. There is an air pressure gauge (43) forward of the cock lever. When the tank is full this gauge should read 2½ lb./sq. in ; as the tank empties pressure will fall gradually to 2 lb./sq. in.
The fuel from the drop tank is fed into the tops of the main inner tanks above the fuel level and cannot, therefore, feed the engines directly. The drop tank can be jettisoned in emergency or when operationally necessary, *see* para. 71.

(iv) The capacities are as follows :

	Permanent tanks galls.	*Aux. tanks galls.*	*Max. capacity galls.*
MAIN SUPPLY			
Inner wing tanks (2 × 188) ...	376	—	—
Outer wing tanks (2 × 87) ...	174		550
LONG RANGE WING TANKS (24+29+29+50)	132		132
FUSELAGE DROP TANK (1 × 200)		200	200
Totals	682	200	882

2. **Fuel cocks**

The two main fuel cocks (30) marked BOTH TANKS OFF—OUTER TANK ON—INNER TANK ON, are mounted on the left-hand cockpit wall level with the pilot's elbow.

When both cocks are set to OUTER TANK ON or INNER TANK ON, the engines are fed from their respective wing tanks.

A crossfeed cock (31) marked SUCTION BALANCE, is mounted outboard of the two main fuel cocks ; it enables either engine to be fed from the tanks in the opposite wing.

3. **Fuel contents gauges**

Eight fuel contents gauges are provided for the wing tanks ; they will only indicate when the electrical services switch, which is linked with the ignition switches, is ON.

The gauges (3) for the port main inner and outer tanks are mounted on the left-hand cockpit wall, above the engine controls box. The gauges (54) for the starboard main inner and outer tanks are mounted on the right

hand cockpit wall above and behind the aileron trimming tab control, while the long-range tank gauges (55) are on the right-hand cockpit wall behind the pilot's right shoulder.

NOTE.—There is no contents gauge for the drop tank.

4. **Fuel pressure warning lights**

Two fuel pressure warning lights (23) are mounted on the bottom right-hand side of the instrument panel. They come on whenever fuel pressure at the carburettors falls appreciably below normal.

5. **Priming system**

A Ki-gass priming pump is fitted in each engine nacelle. A three-way cock next to the pump permits high volatility fuel to be drawn from an outside source for priming at air temperatures below freezing.

6. **Oil system**

(i) Oil is supplied from two self-sealing tanks, each of 24 gallons oil capacity and 6 gallons air space, one in each engine nacelle.

(ii) There are no separate oil cooler controls.

(iii) An oil dilution system is fitted and is controlled by pushbuttons mounted in the engine nacelles.

MAIN SERVICES

7. **Hydraulic system**

(i) Two engine-driven pumps, one on each engine, supply hydraulic pressure for operation of the

Flaps
Undercarriage

The system will function on one pump, but at a reduced rate.

(ii) On the ground, and whenever the normal system is in use, the white topped hydraulic power lever (1), fitted outboard of the flaps position indicator, must be ON.

(iii) In the air the hydraulic power lever must be moved forward to the OFF position ; this operates a by-pass valve and prevents the engine-driven pumps from overheating and consequent failure.

(iv) A handpump (21) is mounted outboard of the elevator trimming tab control, for use if engine-driven pump pressure is not available.

(v) In the event of failure of the normal system the flaps and undercarriage may be lowered through an emergency system which employs separate pipe lines. This system is brought into operation by an emergency selector lever (2) which is mounted outboard of the normal hydraulic power lever and with which it is interconnected (*see* para. 68).

8. **Pneumatic system**

A compressor on the starboard engine charges a bottle for the operation of the

Brakes
Fuel jettison valves
Guns
Landing flare release (if fitted)

The available pressure is shown on a triple reading gauge mounted on the bottom left-hand side of the instrument panel.

Normal operating pressure is 220 lb./sq. in.

9. **Electrical system**

(i) A generator on the starboard engine, and a 24-volt battery, supply power for the operation of the whole of the electrical system.

(ii) An 80-volt alternator on the port engine supplies current for the special radar equipment when this is fitted.

(iii) A generator warning light is mounted on the rear face of the main fuze panel, which is fitted on the port side of the fuselage above the ammunition boxes. The light will come on whenever the generator is not delivering

current. On the ground, when the starboard engine is not running, the light will remain on unless the battery is disconnected. The current consumed, however, is negligible.

(iv) A ground starter battery socket is fitted on the starboard side of the fuselage, just forward of the front entrance hatch.

AIRCRAFT CONTROLS

10. Flying controls

The pendulum type rudder pedals are adjustable for reach during flight by means of the crank handle at the bottom centre of the instrument panel.

11. Flying controls locking gear

Three tubular rods which are pivoted together are used to lock the flying controls. The clip between the two longer rods is attached to the left-hand side of the aileron control handwheel and a fork ended pin at the other joint passes through a hollow bolt at the base of the control column. The end of the short rod is clipped on to the left rudder pedal while the long rod is fastened by a pin to a short strut on the left-hand cockpit shelf. When not in use the locking gear is stowed in the roof above the pilot's entrance hatch.

12. Trimming tab controls

The elevator trimming tab control handwheel (19) is on the right of the cockpit level with the pilot's knee. The tab angle indicator (22) is outboard of the handwheel and below it.

The rudder trimming tab control (18) and indicator are on the right-hand cockpit shelf. The aileron trimming tab (56) control and indicator are on the rear face of the right-hand cockpit shelf. All these controls work in the natural sense.

13. **Undercarriage**

(i) The undercarriage can be raised by two methods and lowered by three :

UP or DOWN by the normal system. Hydraulic power lever ON. Emergency selector lever OFF.	Supply through the normal system.	With pressure provided by the engine - driven pumps.
UP or DOWN by the normal system. Hydraulic power lever ON. Emergency selector lever OFF.	Supply through the normal system.	With pressure provided by the handpump if engine - driven pump pressure is not available.
DOWN only by the emergency system. Hydraulic power lever OFF. Emergency selector lever ON.	Supply through the emergency system.	

(ii) The undercarriage selector lever (26), marked UP—UNDERCARRIAGE—DOWN, incorporates a spring-loaded pin which locks the lever in the down position when the aircraft is on the ground.

(iii) The emergency selector lever (2), marked ON—EMERGENCY—OFF, which is mounted outboard of the hydraulic power lever, has a safety guard which prevents it being set to ON unless the hydraulic power lever is in the OFF (forward) position.

NOTE.—The emergency selector lever must be returned to the OFF position before the hydraulic power lever can be moved to ON.

(iv) When the aircraft is on the ground, safety locking pins should be inserted in the knuckle joints on the inboard radius rods of each undercarriage unit.
Before take-off the pins must be removed and stowed in a bag in the observer's compartment.

14. **Undercarriage position indicators**

The undercarriage position indicators (4) are on the bottom left-hand side of the instrument panel and are switched on and off by the electrical services switch (24). Indications are :

Main wheels and tail wheel locked down—
DOWN on green background.

Main wheels and tail wheel locked up—
UP on red background.

Wheels between locks— Black and white dazzle lines.

NOTE.— (i) A warning horn sounds if the throttles are less than one-third open when any wheel is not locked down.

(ii) Whenever the indicators are suspect, or at night, the handpump should be checked for " solidity " thus ensuring that the undercarriage is locked correctly. If high resistance does not build up immediately, or even if felt, should the indicator not show DOWN do not continue pumping through the main lines, but set the emergency selector ON (power lever OFF) and then pump—*see* para. 68.

15. **Flaps control**

The flaps are controlled by a black topped lever (27) marked UP—FLAPS—DOWN, which is fitted outboard of the undercarriage selector lever. The lever should be returned to the neutral (mid) position after any operation. Intermediate settings may be obtained by returning the lever to the neutral position when the desired flap angle is reached.

16. **Flaps position indicator**

The setting of the flaps is shown on the indicator outboard of the flap control lever. The indicator is connected to the flaps by a flexible cable and is calibrated throughout the flaps range. A thick white line at 20° indicates the maximum lift setting.

17. **Wheel brakes**

The brake control lever (14) and parking catch are mounted on the aileron control handwheel. Differential braking is afforded by means of a relay valve connected to the rudder pedals.

ENGINE CONTROLS

18. **Throttle controls**

The friction control knob for the throttle levers (37) is on the inboard side of the engine controls box. The throttle quadrants are gated at the CRUISING and RATED positions.

19. **Mixture controls**

Mixture control is entirely automatic, being governed by the setting of the throttle levers.

An economical mixture strength is obtained only when these are at or behind the CRUISING gates.

NOTE.—Throttle settings between the CRUISING and RATED gates promote unsuitable mixture strengths and must not, therefore, be used continuously.

20. **Propeller controls**

(i) The speed control levers (36) for the hydromatic propellers, which vary the governed r.p.m. from 2,900 to 1,600, are mounted together in a quadrant outboard of the throttle quadrants. A friction control knob is fitted.

(ii) The feathering pushbuttons (6) are mounted together on the top left-hand side of the instrument panel.

21. **Supercharger controls**

The two-speed supercharger control (41), marked " M " RATIO—TWO SPEED BLOWER—" S " RATIO, are mounted on the left-hand shelf aft of the engine controls box. Hercules XVII engines have superchargers locked in " M " low gear.

NOTE.—When changing gear the controls must always be moved smartly and without pause.

22. **Cowling gills controls**

The two cowling gill motor switches (42) are mounted aft of the supercharger controls. They have three positions, OPEN, OFF and CLOSED. The knobs must be depressed when setting the switches to OPEN or CLOSED. When the required setting is obtained the switches should be returned to the OFF position and the knobs then pulled out.

Red warning lights fitted next to the switches indicate when the motors are running. No gills position indicator is fitted, but their position can be observed from the cockpit.

23. **Carburettor air-intake heat controls**

The two levers (35) mounted in a quadrant outboard of the supercharger controls are moved forward for COLD AIR and back for HOT AIR.

24. **Ignition switches**

These are mounted on the bottom centre of the instrument panel. They cannot be moved to the ON position until the electrical services switch is ON.

25. **Engine starting controls**

The shielded engine starter and booster-coil pushbuttons are mounted on the right-hand side of the instrument panel outboard of the engine speed indicators.

26. **Slow-running cut-out controls**

The two spring-loaded knobs (29), marked ENGINE CUT-OUTS, which are fitted on the left-hand side of the cockpit aft of the pilot's seat, are pulled out and held to stop the engines.

OPERATIONAL CONTROLS

27. **Torpedo sight**

A manually operated sighting control (8) is mounted on the left-hand side of the instrument panel below the oil pressure gauges. The torpedo sight ON—OFF (13) and dimmer switches are mounted on the framing of the right-hand side panel of the windscreen.

28. **Torpedo depth setting control**

The control handle with integral depth indicator is under a hinged cover on the floor forward of the observer's seat.

29. **Torpedo and bomb master selector switches**

These are mounted on the right-hand window sill. A red warning light comes on when the desired store has been selected and goes out after release. If the store fails to release the light will remain on. A shielded jettison pushbutton is mounted aft of the selector switches.

30. **Bomb fusing switches**

These are fitted on a small panel below the master selector switches.

31. **Torpedo and bomb firing pushbutton**

The pushbutton (38) incorporated in the top of the starboard throttle lever releases the torpedo or bombs and automatically operates the torpedo camera if this has been preselected by the switch on the right-hand cockpit wall.

32. **R/P switches**

(i) The R/P master switch is mounted on the left-hand cockpit wall below the V.H.F. radio controller.

(ii) The R/P selector switch (7) is mounted below the left-hand corner of the windscreen and is marked PAIRS—R.P. SELECTOR—SALVO.

33. **R/P Firing pushbutton**

This is mounted on the aileron control hand wheel next to the gun firing pushbutton.

34. **R/P rails jettison control**

This is mounted on the right-hand cockpit wall. It is painted red and is secured by a strap in the safe position.

35. **Gun sight**

A reflector gun sight (12) is fitted above the instrument panel on a swivelling arm which permits it to be swung clear of the windscreen when not in use. A dimmer switch for the gun sight is mounted on the top left-hand side of the instrument panel below the R/P selector switch.

36. **Gun firing pushbutton**

The selective firing pushbutton on the aileron control handwheel is fitted with a spring loaded safety flap. When the flap is at SAFE the camera gun can be fired by pressing the projection on the inboard side of the pushbutton. When it is set to FIRE the pushbutton will fire the cannon and operate the camera gun simultaneously.

OTHER CONTROLS

37. **Cockpit heating and ventilating controls**

(i) The supply of heated air is controlled by a two-position lever on the left-hand cockpit wall level with the pilot's shoulder.

(ii) A ventilator is mounted on the right-hand side of the instrument panel above the engine starter and booster-coil pushbutton.

38. **Cockpit lighting**

(i) A swivelling floodlight is mounted on the framing of each side panel of the windscreen.
The dimmer switches for these lights are on either side of the instrument panel, one above the undercarriage position indicators and the other above the ventilator.

(ii) Two U/V floodlights and an emergency floodlight are mounted on the control column.
The U/V lights are controlled by a rheostat on the right-hand cockpit wall above the aileron trimming tab control, and the emergency light is switched on and off by the switch just forward of this rheostat.

39. **Pilot's seat collapsing lever**

In order to facilitate escape from the cockpit the pilot's seat can be tilted backwards by pulling up the lever (45) on the right-hand side of the seat.

NOTE.— (i) Before the lever can be moved the knob in the top of the lever must be depressed.

(ii) Before take-off care must be taken to ensure that the lever is in the down position and that the seat is correctly locked and cannot collapse.

40. **Windscreen wiper and de-icing controls**

(i) The windscreen wiper is controlled by a rheostat mounted on a bracket on the right-hand side of the instrument panel. Just above the rheostat there is an isolating switch which ensures that battery power is not wasted by leaving the rheostat slightly on when the wiper is not in use.

NOTE.—The wiper should not be used when the windscreen is dry.

(ii) A windscreen de-icing pump (20) and flow control is mounted on the right-hand cockpit shelf immediately aft of the rudder trimming tab control.

41. **R.I. Compass**

The R.I. compass, which is mounted on a bracket on the right-hand side of the instrument panel, is controlled by a two-position switch on the right-hand cockpit wall above the aileron trimming tab control.

PART II

HANDLING

NOTE.—All speeds quoted apply when the Pilot's A.S.I. is connected to the pitot and static sides of the pressure head mounted beneath the port wing.

42. **Management of the fuel system**

(i) Start the engines, warm up, taxy, take-off and climb on the inner tanks, then change to the outer tanks and use them until they are exhausted.

NOTE.—If flying very low the inner tanks should be re-selected when the outer tanks each contain 20 gallons of fuel.

(ii) The SUCTION BALANCE cock should be kept OFF unless

(*a*) all fuel on one side has been lost or consumed ;

(*b*) an engine has failed (*see* para. 64).

(iii) When a drop tank is carried

(*a*) take off on the inner tanks and continue to fly on these tanks for 45 minutes, then turn ON the drop tank cock.

(*b*) when the air pressure gauge reads less than 2 lb./sq. in. the drop tank cock should be turned OFF.

43. **Preliminaries**

(i) On entering the cockpit check :

Ignition switches ...	OFF
Hydraulic power lever ...	ON
Undercarriage selector lever	DOWN, lever locking pin engaged.
Pneumatic supply pressure	Normally 220 lb./sq. in.

then switch on the electrical services switch and check :

Undercarriage position indicators	DOWN.
Fuel contents gauges	

(ii) Check the flying controls for full and free movement.

44. Starting the engines and warming up

(i) Set the controls as follows :

Fuel cocks	INNER TANK ON. Suction balance cock OFF. Drop tank cock OFF.
Throttles	$\frac{3}{4}$-inch open
Propeller speed control levers	Fully forward
Supercharger controls ...	M RATIO (low gear)
Carburettor air intake heat controls	COLD.
Cowling gills	OPEN

(ii) Have each engine turned by hand through at least two revolutions of the propeller to ensure that there is no possibility of hydraulic shock damage.

(iii) Instruct the ground crew to operate the Ki-gass priming pumps until the suction and delivery pipelines are full (this may be judged by a sudden increase in resistance), then have the engines primed with the following number of strokes if they are cold : if K.40 (40 c.c. effective) pumps are fitted, divide by four, giving an incomplete stroke where necessary.

Air temp. ° C.	+30	+20	+10	0	−10	−20
Normal fuel ...	3	4	7	12	—	—
High volatility fuel ...	—	—	—	4	8	18

NOTE.—High volatility fuel should be used at air temperatures below freezing.

(iv) have a ground starter battery plugged in, then switch on the ignition and press the starter and booster-coil pushbuttons. Turning periods must not exceed 20 seconds with 30-second intervals between each period.

(v) The engine should start immediately, but it may be necessary for the ground crew to continue priming until it picks up and runs smoothly on the carburettor.

(vi) When both engines are running satisfactorily have the Ki-gass priming pumps screwed down and the ground starter battery disconnected.

(vii) Run the engines at their lowest steady speed for about one minute, then open up gradually to 1,000 r.p.m. and warm up at this speed.

NOTE.—In very cold weather the engines should be run at their lowest steady speed for 3-4 minutes to avoid the possibility of damaging the oil coolers.

45. **Testing the engines and services**

While warming up :

(i) Check all temperatures and pressures and test the operation of the hydraulic system by lowering and raising the flaps.

(ii) Test each magneto as a precautionary check before increasing power further.

(iii) Check the functioning of both vacuum pumps by operating the changeover cock which is mounted on the bottom left-hand side of the instrument panel.

After warming up to 120° *C.* (*cylinder*) *and* 15° *C.* (*oil*) : *For each engine in turn :*

(iv) Open the throttle to give 0 lb./sq. in. boost and check that all cylinders are operating by verifying that r.p.m. are within 50 of those normally obtained.

NOTE.—While the starboard engine is running at this power setting, the observer should check that the generator is charging the battery.

(v) On aircraft which have Hercules XVIII engines throttle back until r.p.m. fall to 2,400, then check :

(*a*) The operation of the supercharger gear change by changing to S RATIO (high gear), noting the momentary drop in oil pressure and the flicker of the E.S.I.

(*b*) The correct engagement of the S RATIO (high gear) clutches by noting that boost is maintained after the change to high gear is made and that r.p.m. drop to 2,300-2,320 when running in that gear. Then, after 30 seconds, change back to M RATIO (low gear).

(vi) Exercise and check the operation of the constant-speed propeller by moving the speed control lever over its full governing range at least twice. Return the speed control lever fully forward.

(vii) Test each magneto in turn. If the engine is running smoothly but the single ignition drop exceeds 50 r.p.m. the ignition should be checked at higher power (*see* sub. para. (ix) below). If there is marked vibration the engine should be stopped and the fault investigated.

NOTE.—The following additional comprehensive checks should be carried out after repair, inspection, other than daily, or at any time at the discretion of the pilot.

(viii) Open the throttle fully and check boost and static r.p.m.

NOTE.—+10 lb./sq. in. boost will not be obtained without " ram " (see para. 57 (iii)).

(ix) Throttle back to the RATED gate, or further if necessary to ensure that r.p.m. fall below the take-off figure (2,900) and test each magneto in turn. If the single-ignition drop exceeds 50 r.p.m. the aircraft should not be flown.

46. **Taxying**

Before taxying check :

(i) that the ground crew remove and hold up the under-carriage safety locking pins and that they hand them to the observer for stowage.

(ii) that all the entrance hatches are closed and fastened securely.

(iii) the brake pressure and pneumatic supply pressure. Normally the latter should be 220 lb./sq. in. If it is lower check that it has built up while warming up and testing the starboard engine.

47. **Check list before take-off**

H—Hydraulic power lever ...	ON.		
T—Trimming Tabs			
Elevator ...	At full load (including torpedo)	At normal full load (no torpedo, drop tank, or other external stores).	
	"TAKE-OFF" on indicator.	$\frac{1}{8}$-inch aft of "TAKE-OFF" on indicator.	
Rudder ... } Aileron ... }	Neutral.		
P—Propeller speed control levers ...	Fully forward.		
F—Fuel ...	Cocks to INNER TANK ON. Suction balance cock OFF. Drop tank cock OFF.		
F—Flaps ...	Up at light load, 15° down at heavy load, selector neutral.		
Cowling gills	$\frac{1}{2}$ open.		
Superchargers	Low gear.		
Carburettor air-intake heat controls ...	COLD.		

NOTE.—When a torpedo is carried the master selector switch should be set to ON before take-off, so that in an emergency it can be jettisoned immediately.

48. **Take-off**

(i) Align the aircraft carefully on the runway making certain that the tailwheel is straight.

(ii) Check by opening up against the brakes that both engines are responding evenly, then throttle back, release the

brakes and open the throttles slowly and evenly, keeping straight by coarse use of the rudder.

NOTE.—Between the CRUISING and RATED gates power increases rapidly for only a small increase in throttle opening. It is, therefore, important to ease both throttles through the CRUISING gates simultaneously ; if this is not done a swing may easily be induced.

(iii) Raise the tail early in the take-off run to improve rudder control.

(iv) Safety speed at full load (including torpedo) at full take-off power, flaps up or 15° down, is 170 knots (198 m.p.h.) I.A.S.

(v) Raise the flaps (if used) at 300 ft. then set the hydraulic power lever to OFF.

(vi) If a torpedo is carried return the master selector switch to OFF at 1,000 ft.

49. **Climbing**

The recommended climbing speed is 150 knots (172 m.p.h.) I.A.S.

50. **General flying**

(i) *Stability*

At all normal loads stability about all axes is satisfactory.

(ii) *Changes of trim*

Undercarriage up ...	Nose up.
Undercarriage down	Nose down.
Flaps up	Nose down (the change of trim over the last 20° of flap movement is marked).
Flaps down	Nose up (the change of trim over the first 20° of flap movement is marked).
Cowling gills open ...	Nose down.
Cowling gills closed ...	Nose up.

(iii) *Controls*

The elevator and elevator trimming tab controls are light and powerful and must be used with care.

(iv) *Supercharger exercising*

On aircraft which have Hercules XVIII engines every endeavour should be made to change to high gear once every 2 hours during the course of a long flight to avoid the possibility of sludging of the clutch plates.

NOTE.—Supercharger gear changes should not be made at power in excess of 0 lb./sq. in. boost, 2,400 r.p.m.

(v) *Propellers*

With " paddle bladed " propellers there is a tendency to engine overspeeding when power is increased rapidly or during dives. The propeller speed control levers must always be moved slowly and carefully and rapid throttle opening must be avoided.

(vi) *Flying at reduced airspeed in conditions of poor visibility*

Reduce speed to 150 knots (172 m.p.h.) I.A.S. and lower the flaps 20°. Set the propeller speed control levers to give 2,400 r.p.m. Speed may then be reduced to 130 knots (150 m.p.h.) I.A.S.

(vii) *P4 compass inaccuracy*

Firing the cannon is likely to alter the deviation of the P4 compass considerably. Both the R.I. compass and the Observer's compass, however, remain unaffected.

51. **Stalling**

(i) The stalling speeds, engines " off," in knots (m.p.h.) I.A.S. are :

	At full load (including torpedo)	At full normal load (no torpedo drop tank or other external stores)
Flaps and undercarriage up ...	96 (110)	90 (104)
Flaps and undercarriage down	75 (86)	70 (80)

(ii) With the flaps and undercarriage up some warning of the approach of a stall is given by elevator buffeting the onset of which can be felt some 10-12 knots (12-14 m.p.h.) I.A.S. before the stall itself. Just before the stall the right wing tends to drop. This tendency can be checked by use of the ailerons : the nose then drops gently.

(iii) With the flaps and undercarriage down warning of the approach of a stall is less pronounced. At the stall the right wing drops sharply.

(iv) In all cases the recovery from a stall is straightforward and easy.

52. **Diving**

The aircraft becomes increasingly tail heavy as speed is gained and should therefore be trimmed into and during the dive.

53. **Approach and landing**

(i) On entering the circuit check :

Pneumatic supply pressure	220 lb./sq. in.
Cowling gills	CLOSED.
Superchargers	Low gear.
Carburettor air intake heat controls	COLD.

Then reduce speed to 150 knots (172 m.p.h.) I.A.S. and check :

H —Hydraulic power lever	ON.
U —Undercarriage ...	DOWN, check by indicators and warning horn.
P —Propeller speed control levers	Set for 2,400 r.p.m.
F —Fuel	Fullest tanks.
F —Flaps	20° down ; fully down after the final turn into wind.

(ii) The recommended final approach speeds in knots (m.p.h.) I.A.S. are :

	At all loads up to the maximum permissible for landing (22,100 *lb.*)	
	Flaps down	*Flaps up.*
Engine assisted ...	85 (100)	105 (120)
Glide	100 (115)	—

The initial straight approach should, however, be made at a speed some 15 knots (18 m.p.h.) I.A.S. above these figures.

NOTE.—If a landing is to be made with a torpedo slung the speeds quoted above should be increased by at least 5 knots (6 m.p.h.) I.A.S.

54. **Mislanding**

(i) With the flaps and undercarriage down the aircraft will climb away easily at climbing power.

(ii) Raise the undercarriage immediately.

(iii) With the flaps fully down climb at 105 knots (120 m.p.h.) I.A.S.

(iv) As soon as the undercarriage is up raise the flaps to 20° down and increase speed to 120 knots (140 m.p.h.) I.A.S.

(v) At 300 ft. raise the flaps fully and retrim.

55. **Beam approach**

AIRCRAFT TYPE.—BEAUFIGHTER T.F. Mk. X. Return of sortie loading. No ammunition, half fuel remaining (i.e. about 19,500 lb.).

	Preliminary Approach	At Inner Marker on Q.D.R.	At Outer Marker on Q.D.R.	At Outer Marker on Q.D.M.	At Inner Marker on Q.D.M.
Indicated height (feet) ...	1,500	1,500	1,000	800	100
Action ...	Set the cowling gills ½ open. Lower the flaps 20°.*	—	Lower the undercarriage.	Lower the flaps fully.	Throttle back slowly.
Resultant change of trim	Strongly nose up.	—	Slightly nose down	—	—
I.A.S. ...	140 knots (160 m.p.h.)	140 knots (160 m.p.h.)	120 knots (140 m.p.h.)	105 knots (120 m.p.h.)	95 knots (110 m.p.h.)
R.P.M. ...	2,400	2,400	2,400	2,400	2,400
Boost (level flight)	−4 lb./ sq. in.	−4 lb./ sq. in.	−1 lb./ sq. in.	0 lb./ sq. in.	—
Boost (−500 ft./ min.)	−6 lb./ sq. in.	−6 lb./ sq. in.	−3½ lb./ sq. in.	−2 lb./ sq. in.	—
Boost (overshoot)	—	—	—	—	+6 lb./ sq. in.

Remarks—**see* paragraph 59 (ii)

Altimeter error at take-off −50 feet.
Altimeter at touch down −40 feet.
Add 1 millibar to Q.F.E. to give zero reading at touchdown.

OVERSHOOT

Open the throttles evenly to the RATED gates.
Raise the undercarriage.
Climb at 105 knots (120 m.p.h.) I.A.S. and raise the flaps in one movement at 300 ft., retrimming as required.

56. **After landing**

(i) Before taxying raise the flaps and open the cowling gills

On reaching dispersal :

(ii) On aircraft which have Hercules XVIII engines exercise the superchargers once (*see* para. 45 (v)). On aircraft with Hercules XVII engines open the throttles smoothly and slowly to give −2 lb./sq. in. boost, then on all aircraft.

(iii) Close the throttles slowly until r.p.m. fall to 800-900 and run at this speed for 2 minutes.

(iv) Stop the engines by pulling out the slow running cut-out controls.

(v) Should a back-fire occur at any stage, open up to −2 lb./sq. in. and repeat the above procedure.

(vi) When the engines have stopped turn off the fuel, switch off the ignition, and when the engines have cooled close the cowling gills, then switch off all other electrical services.

(vii) *Oil Dilution* (*see* A.P. 2095).

The correct dilution period for these engines is 1 minute.

(viii) On leaving the cockpit ensure that the undercarriage safety locking pins are inserted in the knuckle joints of each undercarriage unit.

PART III

OPERATING DATA

57. Engine data—Hercules XVII and XVIII

(i) Fuel—100/130 grade.

(ii) Oil—*see* A.P. 1464/C37.

(iii) The principal engine limitations are as follows :

	Super-charger gear†	R.P.M.	Boost lb./sq. in.	Temp. °C.	
				Cyl.	Oil
MAX. TAKE-OFF TO 1,000 FT. ...	M	2,900	+10*	230 at start of take-off	—
MAX. CLIMBING 1 HOUR LIMIT	M, S	2,400	+6	290	90
MAX. RICH ... CONTINUOUS ...	M, S	2,400	+6	290	80
MAX. WEAK ... CONTINUOUS ...	M, S	2,400	+2	290	80
COMBAT ... 5 MINS. LIMIT ...	M, S	2,900	+10*	300	100

† S (high) gear is not operative on Hercules XVII engines.

* With the " ram " effect obtainable in level flight, boost should be +10 lb./sq. in. at low altitude.
With the aircraft stationary boost will probably not exceed +8¼ lb./sq. in.

OIL PRESSURE : NORMAL ... ... 80–90 lb./sq. in.
EMERGENCY MINIMUM (5 MINS.) ... ... 60 lb./sq. in.

MINM. TEMP. FOR TAKE-OFF—
OIL : NORMAL ... ... 15° C.
OPERATIONAL NECESSITY ... ... 5° C.
CYL : ... ... 120° C.

MAX. TEMP. FOR STOPPING ENGINE—CYL. ... 230° C.

58. **Position error corrections**

At 23,000 lb. the corrections for position error are :

FROM ...	100	120	140	160	180	200	220	240	260	280	m.p.h.
TO ...	120	140	160	180	200	220	240	260	280	300	m.p.h.
ADD ...	7	5	3	1	—	—	—	—	—	—	knots or m.p.h.
SUBTRACT	—	—	—	—	1	2	4	6	7	8	
FROM ...	87	104	121	139	156	174	190	208	226	243	knots
TO ...	104	121	139	156	174	190	208	226	243	260	knots

59. **Flying limitations**

(i) The aircraft is designed for the duties of a long-range reconnaissance fighter. Intentional spinning and aerobatics are prohibited.

(ii) *Maximum speeds in knots (m.p.h.) I.A.S.*

Diving :

(*a*) Without external stores 345 (400)

(*b*) With 8 × 60 lb. R/P 300 (345)

(*c*) With torpedo 320 (370)

NOTE.—When carrying 2 × 500 lb. bombs and 2 × 250 lb. depth charges, it is recommended that a speed of 325 knots (375 m.p.h.) should not be exceeded and with 8 × 60 lb. R.P. a speed of 300 knots (345 m.p.h.) should not be exceeded.

Lowering flaps 175 (200)

Flaps fully down 116 (135)

Lowering undercarriage 150 (170)

Undercarriage down 130 (150)

Jettisoning drop tank 210 (240)

(iii) *Maximum weights*

For take-off and gentle manoeuvres	... 25,500 lb.†
For all forms of flying	... 22,100 lb.
For landing	... 22,100 lb.*

† For training the take-off weight should not exceed 21,000 lb.

* In emergency the aircraft may be landed on prepared runways at weights up to 25,000 lb. provided that

(*a*) Mod. T.402 is incorporated.

(*b*) AIR 32160.1 type main undercarriage units are fitted.

60. **Maximum performance**

(i) *Climbing*

(*a*) The speed for maximum rate of climb is 130 knots (150 m.p.h.) I.A.S. from sea level to 12,000 ft., thereafter reducing speed by 1 knot or m.p.h. I.A.S. per 1,000 ft.

Since this speed is less than safety speed at climbing power it is recommended that an initial climbing speed of 150 knots (172 m.p.h.) I.A.S. should be maintained at least until the boost in low gear falls and further if the maximum rate of climb is not essential.

(*b*) On aircraft which have Hercules XVIII engines change to high gear when the boost in low gear has fallen to +4 lb./sq. in.

NOTE.—Throttle back to 0 lb./sq. in. boost before engaging high gear, then set the throttles to the RATED gates again.

(ii) *Combat*

(*a*) Set the propeller speed control levers fully forward and open the throttles fully. If the maximum obtainable boost is +7 lb./sq. in. or less, throttle back to the RATED gates.

(*b*) On aircraft which have Hercules XVIII engines change to high gear if the maximum obtainable boost in low gear is +7 lb./sq. in.

NOTE.—If possible power should be reduced to 0 lb./sq. in. boost, 2,400 r.p.m., before the change to high gear is made (*see* para. 50 (iv)).

61. **Maximum range** (*see* Curves, page 35)

(i) *Climbing*

Set the propeller speed control levers to give 2,400 r.p.m., the throttles to the RATED gates and climb at 150 knots (172 m.p.h.) I.A.S. Change to high gear when the boost in low gear has fallen to +4 lb./sq. in.

NOTE.—Throttle back to 0 lb./sq. in. boost before engaging high gear, then set the throttles to the RATED gates again.

(ii) *Cruising*

(*a*) The recommended speed for maximum range is 175 knots (200 m.p.h.) I.A.S.

(*b*) Set the throttles to the CRUISING gates and obtain the recommended speed by adjusting r.p.m. between 2,400 and 1,600.

NOTE.—R.p.m. which promote rough running must be avoided at all times.

(*c*) At moderate and high altitudes change to high gear if the recommended speed cannot be maintained with the throttles at the CRUISING gates and the propeller speed control lever set to give 2,400 r.p.m.

62. **Fuel capacities and consumptions**

(i) *Fuel capacities*

	Permanent tanks galls.	*Aux. tanks galls.*	*Max. capacity galls.*
MAIN SUPPLY			
Inner wing tanks (2 × 188)	376	—	—
Outer wing tanks (2 × 87)	174		550
LONG RANGE WING TANKS (24 + 29 + 29 + 50)	132		132
FUSELAGE DROP TANK (1 × 200) ...		200	200
Totals	682	200	882

(ii) *Fuel consumptions*

(*a*) The approximate total fuel consumption in the rich mixture range is

Boost lb./sq. in.	*R.P.M.*	*Gallons/hour*
+10	2,900	400
+ 8¼	2,900	376
+ 6	2,900	346
	2,400	254

(*b*) The approximate total fuel consumption (gallons/hour) in the weak mixture range is,

(i) Low gear at 2,000 ft.

Boost lb./sq. in.	R.p.m.					
	2,400	2,200	2,000	1,800	1,700	1,600
+2	125	115	106	96	91	—
+1	115	108	100	91	86	82
0	109	101	94	86	81	77
−1	104	95	86	77	73	69
−2			81	72	68	64
−3				67	64	60
−4				63	60	57

NOTE.—For every 1,000 ft. above or below this height add or subtract ½ gallon per hour.

(ii) High gear at 10,000 ft.

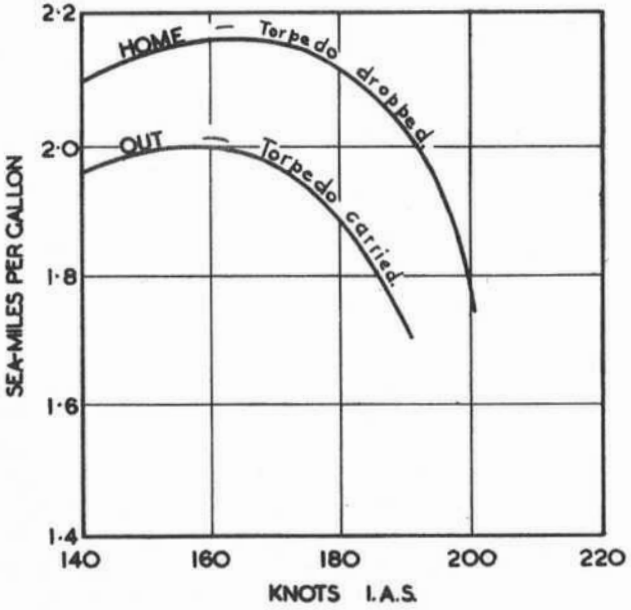
Boost lb./sq. in.	R.p.m.					
	2,400	2,200	2,000	1,800	1,700	1,600
+2	123	116	108			
+1	118	110	103			
0	110	102	95	89	84	
−1	102	95	89	82	79	75
−2	96	89	83	76	73	69
−3	88	81	75	69	66	63
−4	81	76	71	65	62	58

NOTE.—For every 1,000 ft. above or below this height add or subtract 1 gallon per hour.

BEAUFIGHTER TF X.

—CRUISING—

RANGE AT 5,000 FEET



PART IV

EMERGENCIES

63. **Engine failure after take-off**

(i) Safety speed at full load (including torpedo), at full take-off power, flaps up or 15° down, is 170 knots (196 m.p.h.) I.A.S.

(ii) If safety speed has been attained the aircraft will climb away comfortably on either engine at climbing power at about 150 knots (172 m.p.h.) I.A.S., provided that,

(*a*) the torpedo is jettisoned ;

(*b*) the propeller of the failed engine is feathered and the gills are closed on that side ;

(*c*) the flaps are fully up.

NOTE.—The drag of a windmilling " paddle-bladed " propeller is very high and unless feathering action is taken immediately an engine fails control can only be retained at the expense of a rapid loss of height.

64. **Engine failure in flight**

(i) Close the throttle of the failed engine and feather its propeller (*see* para. 65).

NOTE.—The windmilling drag of a " paddle-bladed " propeller is very high and unless feathering action is taken immediately an engine fails control difficulties may be experienced, especially if the failure occurs on a high power climb. Under these circumstances it will generally be necessary to throttle back the live engine to prevent control being lost.

(ii) In order to use the fuel from the tanks on the failed engine side

(*a*) set the SUCTION BALANCE cock ON ;

(*b*) turn OFF the main tanks cock on the live engine side.

(iii) When the tanks on the failed engine side each contain 20 gallons of fuel,

(*a*) set the main tanks cock on the live engine side to the fuller tank ;

(*b*) set the SUCTION BALANCE cock OFF ;

(*c*) turn OFF the main tanks cock on the failed engine side.

(iv) At full load in favourable conditions height can be maintained on either engine at full climbing power at 145-150 knots (167-172 m.p.h.) I.A.S.

(v) In single-engine flight the rudder must be used with great care. It is a powerful and sensitive control and if used coarsely can promote considerable yaw and roll.

65. **Feathering**

(i) Close the throttle immediately.

(ii) Hold the feathering pushbutton in only long enough to ensure that it stays in by itself, then release it so that it can spring out when feathering is complete.

(iii) Switch off the ignition when the propeller has stopped, or nearly stopped, rotating, then close the gills.

NOTE.—Should engine failure occur early after take-off (ii) may precede (i).

66. **Unfeathering**

(i) Set the propeller speed control lever fully back and ensure that the throttle is closed.

(ii) Switch on the ignition and press the feathering push-button, releasing it when r.p.m. rise to 800-1,000.

NOTE.—(*a*) If the propeller does not return to normal constant-speed operation it must be re-feathered and unfeathered again, the feathering pushbutton then being released at slightly higher r.p.m.

(*b*) To avoid the risk of engine overspeeding a propeller should not be unfeathered at speeds above normal cruising speed.

(*c*) There is a generator only on the starboard engine. When the propeller of this engine is feathered, therefore, it is important to switch off all non-essential electrical services.

67. **Fuel jettisoning**

(i) The fuel in the wing tanks, except that contained in No. 1 L.R. tanks, can be jettisoned by operating the PORT and STBD. JETTISON RELEASE levers (25), which are mounted on the bottom left-hand side of the instrument panel above the electrical services switch.

(ii) When all the tanks are full the main bulk of the fuel can be jettisoned in about one minute.

(iii) When it is desired to jettison only a part of the fuel load the levers should be operated for a few seconds at a time. The fuel contents gauges should then be checked after each operation.

NOTE.—If the pneumatic supply pressure is below 80 lb. sq. in. the fuel jettison valves cannot be operated.

68. **Undercarriage and flaps emergency operation**

(i) Should the undercarriage or flaps fail to lower when selected normally, set the emergency selector lever to ON (this automatically moves the hydraulic power lever to OFF and, the flap lever from UP to NEUTRAL): operate the handpump.

NOTE.—(*a*) If the undercarriage up locks fail to release, very considerable pressure may be required on the handpump to free them.

(*b*) With the flap lever at NEUTRAL the undercarriage will come down without the flaps : to lower the flaps the flap lever must be at DOWN.

(*c*) The undercarriage and flaps cannot be raised through the emergency system.

(ii) If the emergency system fails, set the emergency lever OFF and the power lever ON, then try the handpump through the normal system.

69. **Single-engine landing**

(i) A left-hand circuit can safely be made (and is recommended) irrespective of which engine has failed.

(ii) While manoeuvring with the undercarriage and flaps up, maintain a speed of at least 140 knots (160 m.p.h.) I.A.S.

(iii) Keep extra height in hand if possible and lower the undercarriage as late as practicable, aiming to have it locked down just before the final straight approach.

(iv) When cross wind preparatory to turning into the airfield the flaps may then be lowered 20°. They should not be lowered further until it is clear that the landing area is within easy reach.

(v) The live engine should be used carefully to regulate the rate of descent throughout the approach, the final stage of which should be made at a speed of 95-100 knots (110-115 m.p.h.) I.A.S.

70. **Fire-extinguishers**

(i) Two shielded pushbuttons (9) on the top left- hand side of the instrument panel, behind the propeller feathering pushbuttons, operate the engine fire-extinguishers (in the event of a crash operation is automatic).

(ii) There are two engine fire warning lights on the top right-hand side of the instrument panel.

(iii) Two hand fire-extinguishers are stowed at convenient points within the fuselage.

71. **Torpedo, bomb, R/P rails and drop tank jettisoning**

(i) The torpedo or bombs can be jettisoned when the master selector switches (15) are ON by pressing the shielded pushbutton (46) on the switch panel on the right-hand window sill.

(ii) The R/P rails can be jettisoned by pulling back the red lever (16) mounted on the right-hand cockpit wall (*see* para. 34.)

(iii) The drop tank can be jettisoned by setting the DROP TANK JETTISONING switch to ON and pressing the release pushbutton. When the switch is ON a warning light next to the pushbutton comes on. This light goes out as the tank is released.

72. **Parachute exits**

(i) Whenever possible the pilot's and observer's entrance hatches should be used as parachute exits.
To open them pull the bottom catch release lanyards smartly, the airstream will then open the hatches and lock them.

NOTE.—As the pilot's hatch opens the aircraft becomes tail heavy, but the change of trim is not great and can easily be held while retrimming.

(ii) After each minor inspection the operation of these hatches should be checked in flight at speeds between 130 and 220 knots (150 and 250 m.p.h.) I.A.S. For these tests the aircraft should be lightly loaded.

(iii) If the hatches open accidentally in flight it should be possible to close them again if

(*a*) Pilot's hatch—the undercarriage is lowered ;
the flaps are lowered 20° ;
speed is reduced to 100 knots (115 m.p.h.) I.A.S.

(*b*) Observer's hatch—speed is reduced below 175 knots (200 m.p.h.) I.A.S.

WARNING.—With a torpedo slung these hatches cannot be used. If the torpedo cannot be jettisoned escape will have to be made through the crash exits (*see* para. 73).

73. **Crash exits**

In the event of a crash escape can be made

(i) through the roof of the pilot's cockpit ;

(ii) through the right-hand window of the pilot's cockpit. The window is jettisoned by pulling back the release lever (53) on the lower frame and then pushing it outwards ;

(iii) through the hood of the observer's cockpit. The release levers are on the port side of the fuselage.

74. **Dinghies**

A multi-seat dinghy is fitted in a blow-out stowage built into the trailing edge of the port wing. The dinghy is secured to the interior of the stowage structure by a light cord ; a pack containing rations, drinking water, paddles and recognition devices is stowed in the dinghy compartment and is connected to the dinghy by a lanyard. There are three alternative installations :

(i) A type " H " dinghy fitted with a type " G " operating head. With this installation provision is made only for manual release of the dinghy by the handle on the stowage cover.

(ii) A type " H " dinghy fitted with a type " H " operating head. In addition to an immersion switch for automatic operation of the type " H " head three manual releases are provided :

(*a*) Internally, on the left-hand cockpit wall just behind the pilot's shoulder.

(*b*) Internally, on the port side of the fuselage below the observer's hood.

(*c*) Externally, forward of the leading edge of the fin.

(iii) A type " L " dinghy. This is operated as described in (ii) above.

In addition to the multi-seat dinghy there is provision for a " K_1 " type dinghy both for the pilot and the observer.

75. **Ditching** (*see* A.P. 2095)

If ditching is unavoidable :

(i) Unlock the hoods of both cockpits, then swing the gunsight to the stowed position. If time permits the gunsight should be removed, by unscrewing the knurled nut half a turn, pulling out the electric supply plug and the quick release pin (which is on the right-hand side of the sight), and thrown into the well just behind the seat.

(ii) Keep the safety harnesses tightly adjusted. Disconnect the R/T plugs.

(iii) Keep the undercarriage retracted, but lower the flaps 30° to reduce the touch-down speed as much as possible.

(iv) Use the engines, if they are available, to ensure that the touchdown is made in a tail-down attitude at as low a forward speed as possible.

(v) Ditch along the swell or into wind if the swell is not steep.

NOTE.—Deceleration is likely to be severe and much water may come over the nose and into the cockpit. As contact with the water is made a swerve is not unlikely.

PART V

ILLUSTRATIONS

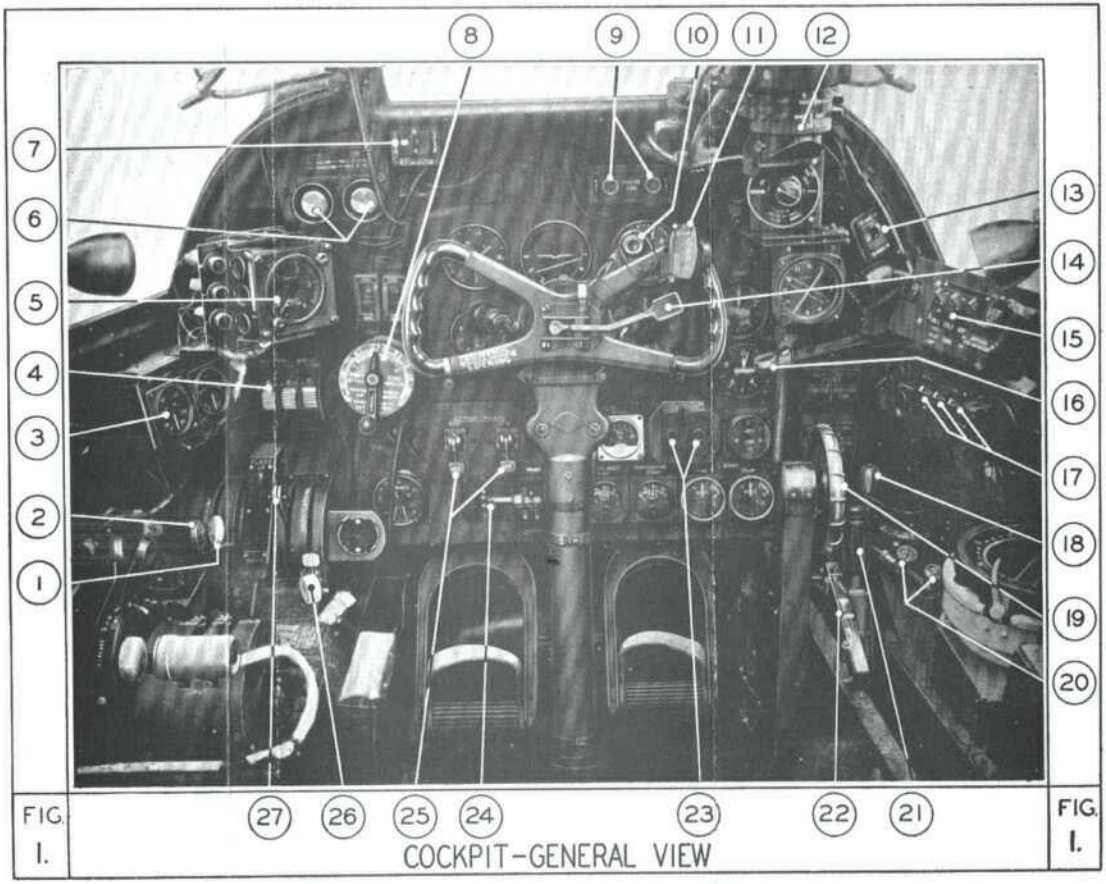


FIG. 1. COCKPIT-GENERAL VIEW FIG. 1.

1. Hydraulic power lever.
2. Hydraulic emergency selector lever.
3. Fuel contents gauges (port).
4. Undercarriage position indicators.
5. Radio altimeter.
6. Feathering pushbuttons.
7. R.P. selector switch.
8. Torpedo sight control.
9. Fire-extinguisher switches.
10. R.P. firing pushbutton.
11. Camera and gun firing switch.
12 Reflector gun sight.
13. Torpedo sight control switch.
14. Wheel brakes lever.
15. Torpedo and bomb selector switches.
16. R.P. rails jettison control lever.
17. Bomb fusing switches.
18. Rudder trim tab control
19. Elevator trim tabs handwheel.
20. Windscreen de-icing pump.
21. Hydraulic handpump.
22. Elevator trim tab indicator.
23. Fuel pressure warning lights.
24. Electrical services switch.
25. Fuel jettison levers.
26. Undercarriage selector lever.
27. Flap control lever.

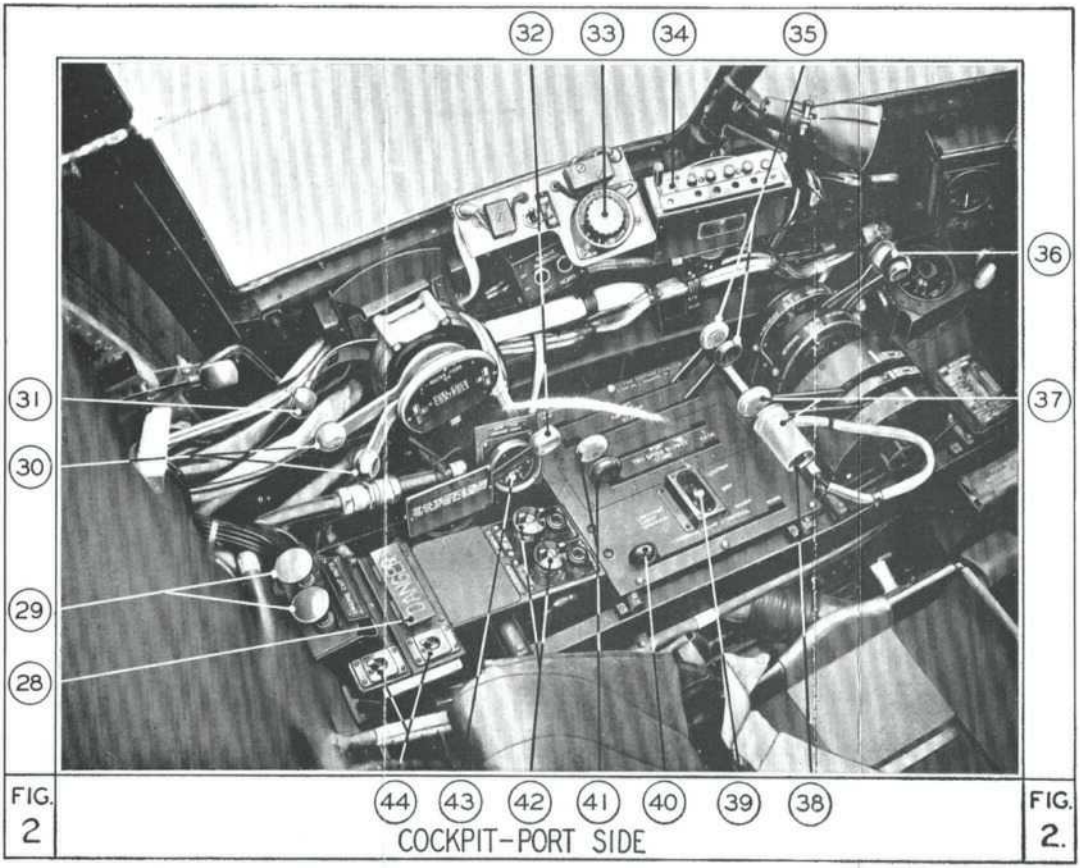


FIG. 2

COCKPIT–PORT SIDE

FIG. 2.

28. Destruction switches A.R.I. 5025.
29. Engine cut-out controls.
30. Fuel cock control levers.
31. Fuel crossfeed cock lever.
32. Drop tank fuel cock lever.
33. R.T. volume control.
34. Electric controller (radio).
35. Air intake controls.
36. Propeller speed controls.
37. Throttle controls.
38. Torpedo and bomb firing pushbutton.
39. Landing lamp switch.
40. Landing lamp control.
41. Supercharger controls.
42. Cowling gills controls and indicator lamps.
43. Drop tank pressure gauge.
44. Distress switch and master switch.

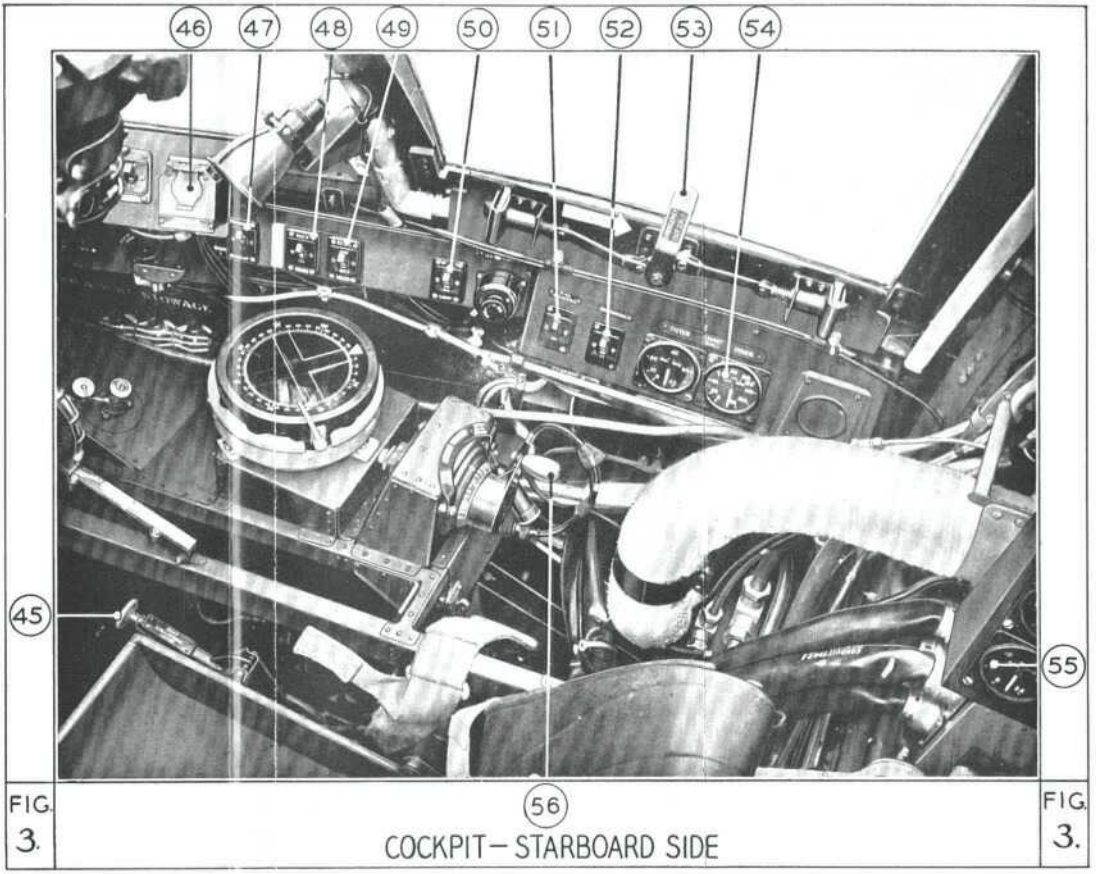
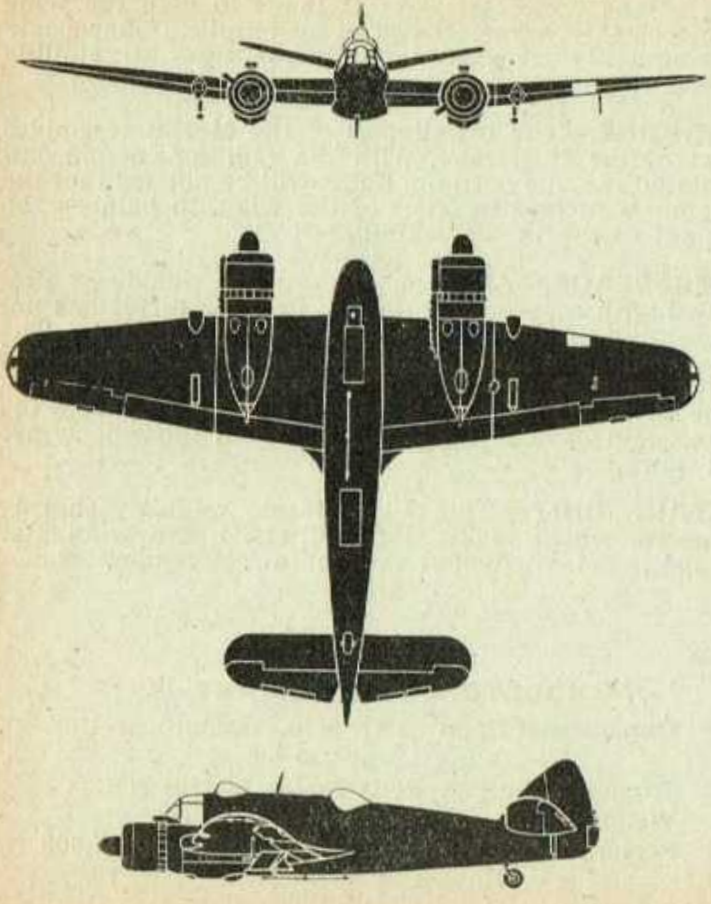


FIG. 3. COCKPIT—STARBOARD SIDE FIG. 3.

45. Seat collapsing lever.
46. Bomb jettison switch.
47. Identification lights switch.
48. Navigation lights switch.
49. Pressure head heater switch.
50. Emergency light switch.
51. F46 camera switch.
52. R.I. compass switch.
53. Release handle—knock out panel.
54. Fuel contents gauges (starboard).
55. Fuel contents gauges (long range).
56. Aileron trim tab control.



BRISTOL BEAUFIGHTER

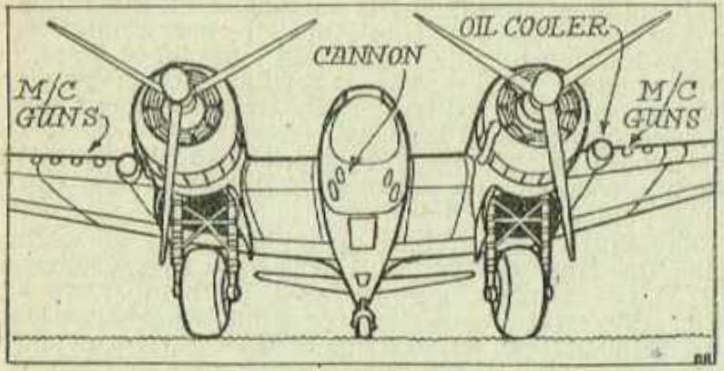
The Beaufighter is the largest and heaviest fighting aeroplane yet built. It also carries heavier armament than any previous type. The weight is more than nine tons. There are four cannon in the nose and six machine guns in the outer wings. The Beaufighter presents a reversal of the tactics around which the Defiant was designed, for all its guns are fixed. The pilot does all the fighting and the second member of the crew is principally a navigator. Despite its large size and very high wing loading, the Beaufighter manœuvres well and the fixed gun arrangement has proved satisfactory. The long range—1,500 miles—combined with high speed, make the Beaufighter very effective as a long-range fighter. It has proved particularly valuable in protecting shipping from air attacks beyond the reach of smaller fighters.

The Beaufighter also possesses all the qualities required of a night fighter—great endurance; it can remain airborne all night if necessary, and heavy concentration of fire to give it every chance of making a "kill" in brief night encounters. Not content with lying in wait for the enemy, Beaufighters have done excellent work as "intruders," shooting up landing fields in France and the Low Countries when they light up for their own bombers to land.

WINGS.—The wings of the Beaufighter are interchangeable with those of the Beaufort torpedo-bomber, as are also the tail surfaces. This feature has saved much valuable time in production. The wings have a fairly gentle taper and no unusual features.

ENGINES.—The engines and the fuselage are the only features of the Beaufighter which differ from the Beaufort bomber. As the engines were bigger they

required bigger diameter airscrews. Therefore, to keep adequate ground clearance and still employ the same



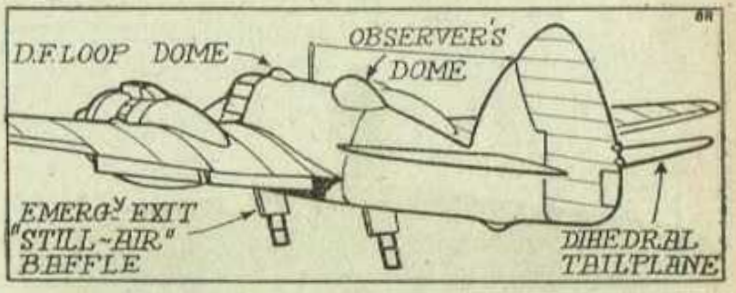
undercarriage as the Beaufort it was necessary to mount the engines higher on the wing. This is a bad point aerodynamically as engine nacelles give their lowest air resistance, and upset the airflow round the wing least, when they are underslung.

The large air intakes in the leading edge are for oil coolers.

The Mk I. (as illustrated) has Hercules radial engines. The Mk II. has R.R. Merlins.

FUSELAGE.—The nose of the fuselage was necessarily kept short so as to give sideways clearance for the bigger airscrews. Apart from this it is obviously in the best interests of speed to cut down the size of the fuselage to the minimum necessary to carry the crew and fuel.

The main reason for having no rear turret and relying solely on the fixed guns was to gain speed, as any effective form of turret presents very high air resistance. The second member of the crew is situated well aft, with a small cupola to enable him to take observations for navigating. A second and smaller transparent dome forward encloses the loop of the direction finding aerial.



TAIL UNIT.—The tail unit follows characteristic "Bristol" lines. The most unusual feature is the dihedral on the tailplane. This acts in the same way as the fin in holding the aircraft straight. It helps to prevent swing when taking-off. As the fin and rudder are not in the slipstream of the airscrews, they are not highly effective at the relatively low take-off speed.

BRISTOL BEAUFIGHTER I.

Dimensions: Span 57 ft. 10 in Length 41 ft. 4 in.
Wing area 503 sq. ft.

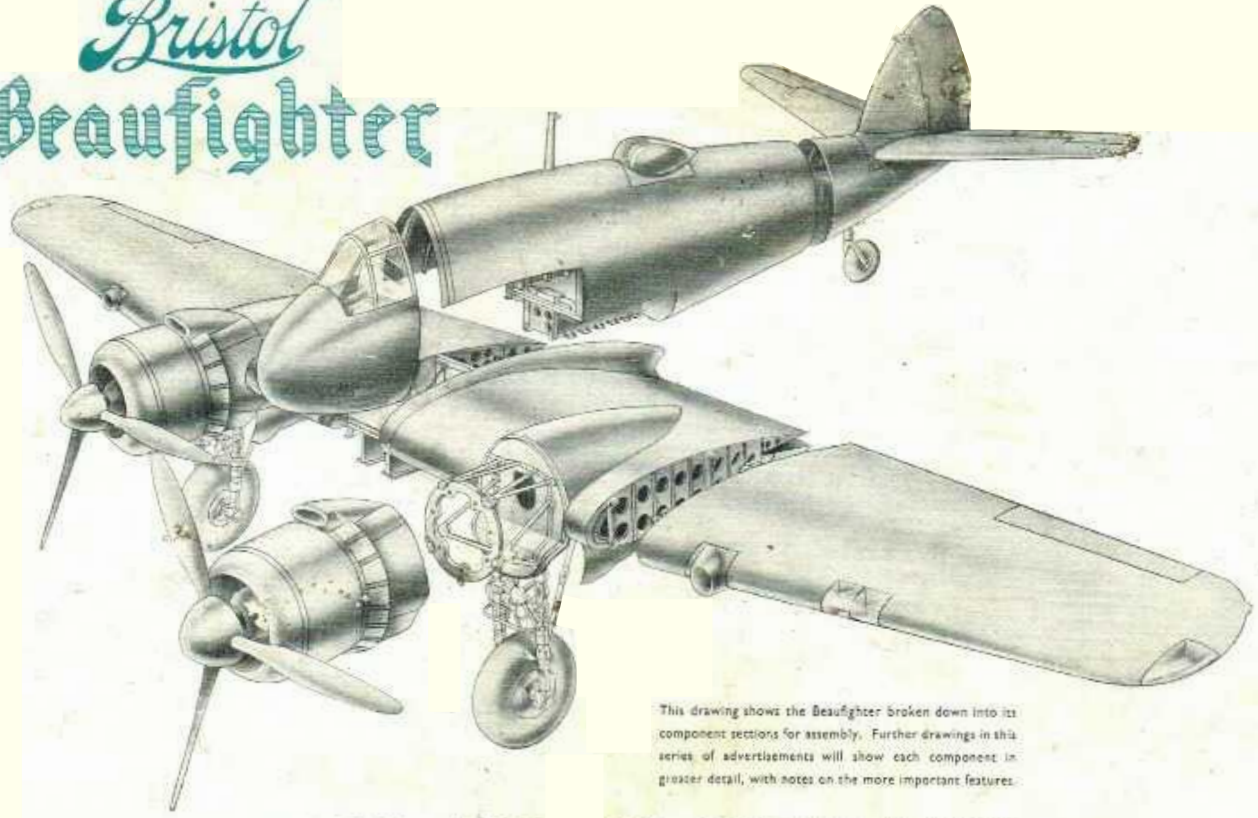
Engines: 1,400 h.p. Bristol Hercules III.

Weight: Empty 13,600 lb. Loaded 20,800 lb.

Performance: Max. speed 315 m.p.h. at 14,000 ft.
Range: 1,500 miles.
Service ceiling: 28,900 ft.

FEATURES OF THE

"Bristol" Beaufighter



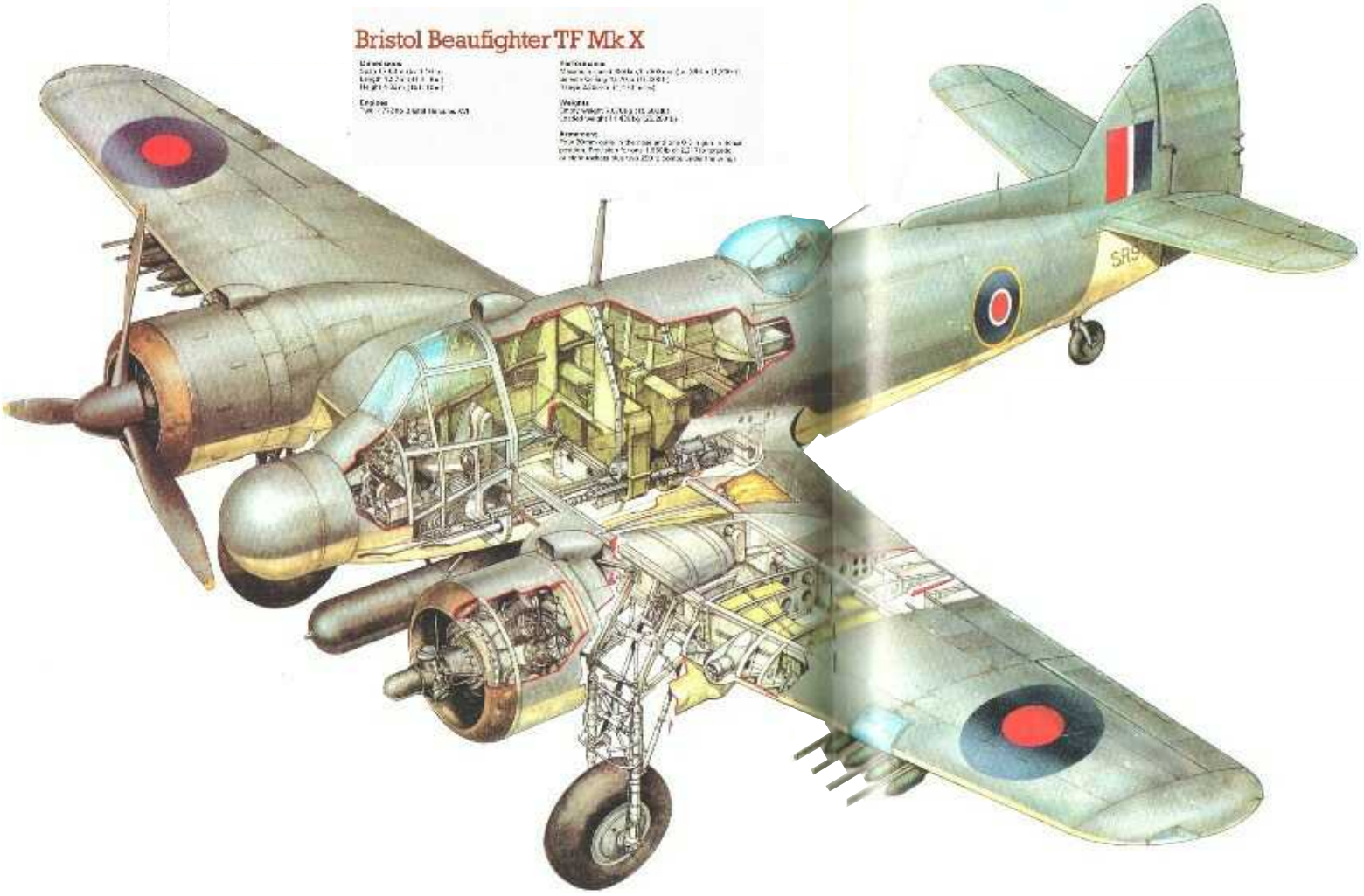
This drawing shows the Beaufighter broken down into its component sections for assembly. Further drawings in this series of advertisements will show each component in greater detail, with notes on the more important features.

THE BRISTOL AEROPLANE COMPANY LIMITED

BEAUFIGHTER

The torpedo-bomber (top) and the rocket-firing version (below) are two recent versions of this versatile aircraft. M.A.P. figures for IC and F give the top speed as 324 m.p.h. at 11,750 ft. at a flying weight of 18,987 lb. The engines are Hercules IIIs giving 1,410 h.p. at 10,750 ft.

Bristol Beaufighter TF Mk X



THE BRISTOL " BEAUFIGHTER " I

Manufacturers : The Bristol Aeroplane Co., Ltd., Filton, near Bristol.

Purpose : Night fighter and long-range twin-motor two-seat escort fighter.

Power Plant : Two Bristol Hercules III air-cooled radial motors, maximum level power (each), 1,220/1,270 h.p. at 2,800 r.p.m. at 15,000 ft. (" S " blower gear), 1,365/1,425 h.p. at 2,800 r.p.m. at sea level (" M " blower gear); cruising ratings, 1,045/1,090 h.p. at 2,400 r.p.m. at 14,500 ft. (" S " blower gear), 1,125/ 1,170 h.p. at 2,400 r.p.m. at 2,500 ft. (" M " blower gear) ; take-off, 1,365/1,425 h.p. at 2,800 r.p.m. at sea level Two-stage supercharger.

Construction : Wings—All-metal two-spar structure with flush-riveted light alloy stressed-skin covering. Bristol-Frise type aerodynamically-balanced ailerons. Split trailing edge flaps in four sections. Fuselage—All-metal light alloy monocoque structure with " Z "-section transverse frames and extruded light alloy bulb-angle stringers with light alloy stressed-skin covering, flush-riveted. In three main sections comprised of nose, centre-section and stern. Tail unit—Light alloy structure with stressed-skin flush-riveted. Tailplane tips are of wood. Control surfaces are of metal structure and have fabric-covering. Undercarriage—Backwards retracting type, the main wheels being completely enclosed by hinged doors when in the retracted position in the motor nacelles. Twin oleo-pneumatic shock-absorbing struts to each wheel. Fully-retractable tailwheel. De Havilland Hydromatic fully-feathering constant speed airscrews.

Dimensions : Span, 57 ft. 10 in. Length, 41 ft. 4 in. Height, 15 ft. 10 in.

Areas : Wings, 503 sq. ft.

Weights : Empty, 13,600 lb. Loaded, 20,800 lb. Disposable load, 7,200 lb.

Loadings : Wing, 46·2 lb./sq. ft. Power, 7·3 lb./h.p.

Tankage : Fuel, 550 gallons. Oil, 36 gallons.

Performance : Maximum speed, 330 m.p.h. at 14,000 ft.; operating speed, 200 m.p.h. at 14,000 ft.; initial climb, 1,850 ft./min.; service ceiling, 28,900 ft.; range at operating speed, 1,500 miles.

Armament : (Night fighter)—Four fixed 20 mm. (Oerlikon design and Hispano licence) shell-guns mounted in the nose and positioned so as to be easily accessible by the observer to enable jams to be cleared, and six fixed ·303 Browning machine-guns, mounted four in the starboard wing and two in the port wing. The shell-guns fire at the rate of 550 rounds per minute and the machine-guns at 1,250. No rear armament.

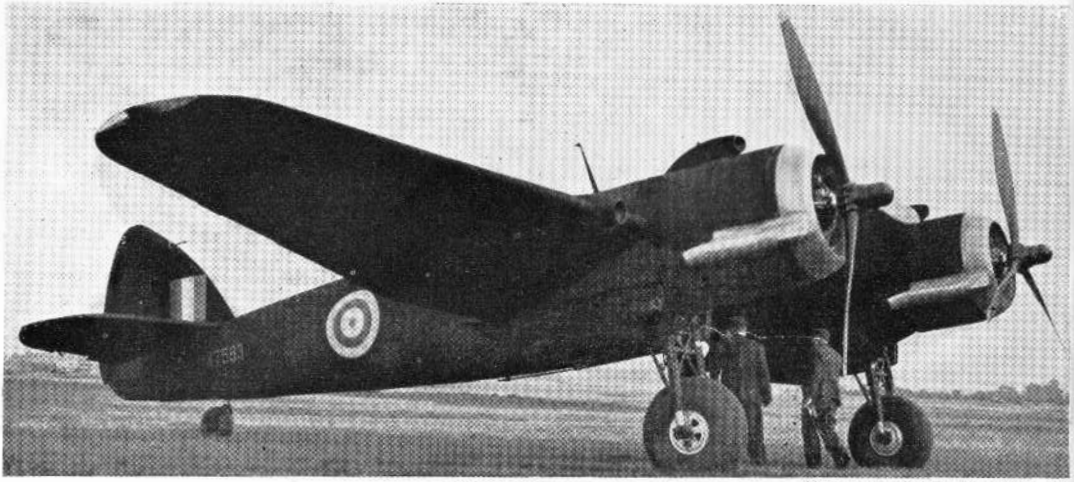


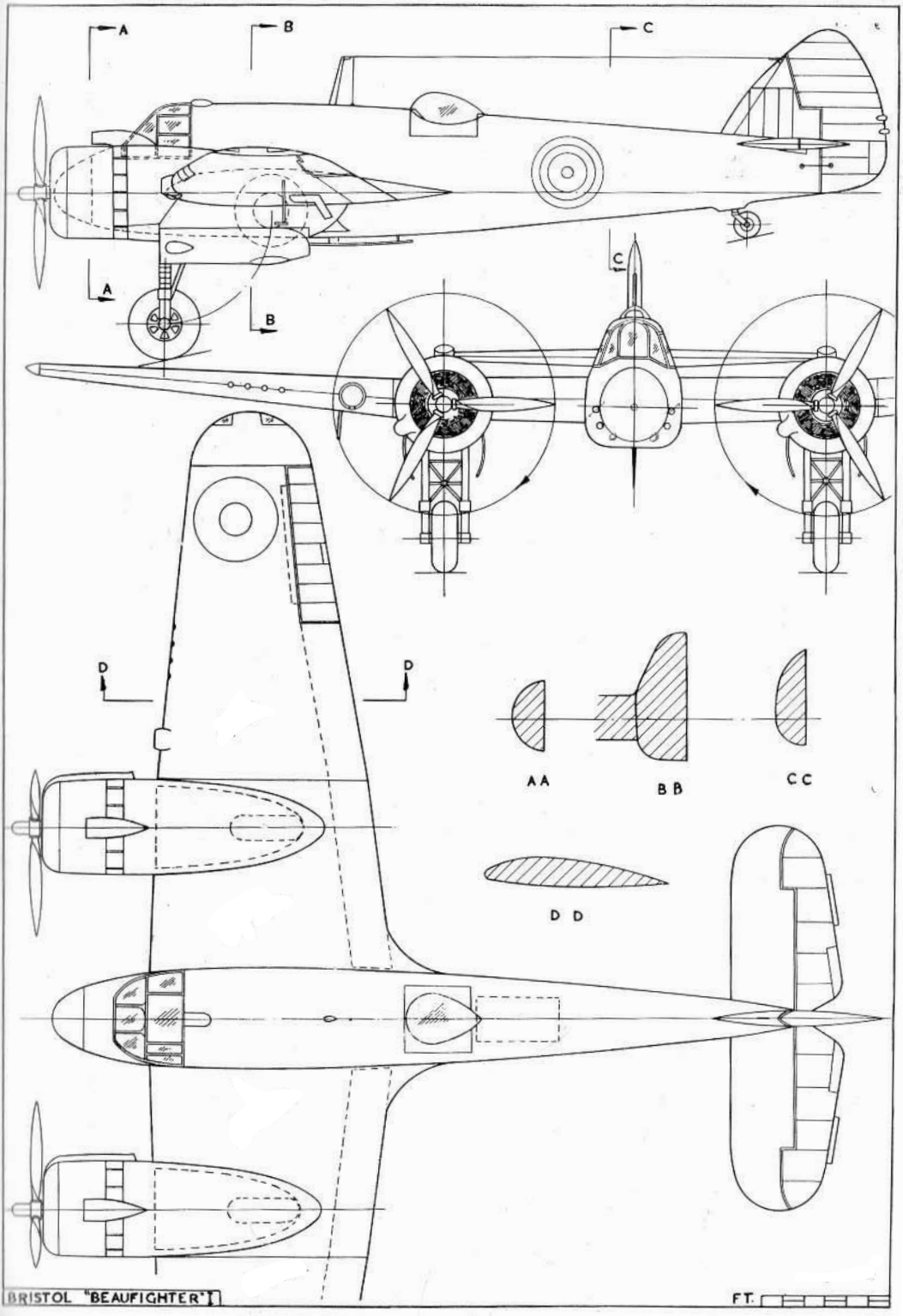
Photo by courtesy of Central Press Photos, Ltd.

Beaufighters went into production in 1940 and the design was based on that of the Beaufort torpedo-bomber which was particularly suited for re-design as a night fighter because of the extraordinary torsional stiffness combined with light structure weight exhibited by the mainplanes and tail unit. These items are, in fact, identical on the Beaufighter, and the only completely new section of the aeroplane is the fuselage, which was designed with particular attention to ease of production and sub-divided into many self-contained sub-assemblies to facilitate manufacture by various sub-contractors for assembly at a central plant. Production has now reached an impressive rate by this method.

The Beaufighter has the Bristol Works No. 156 and is built in two versions : the normal night fighter for Home Defence and the long-range escort day fighter for service either in this country or the Middle East. The first Beaufighter day fighters arrived in the Middle East just too late to be of value in the defence of Crete but they are now in service in useful numbers. The day versions used in the desert have special combined intakes and filters above the cowling. Some of the Middle East Beaufighters have been fitted with light bomb racks and used as fighter-bombers with pronounced success on low-flying strafes against Italian aerodromes.

Night-flying Beaufighters of the Fighter Command are entirely soot-black and one squadron carries the letters ST in grey on the fuselage sides. The serial number of one night fighter version is X7583, painted in red.

Day fighters of one squadron carry the letters PN. Machine " W " of the unit is numbered R2153 and machine " B," R2198. Another squadron's code letters are ZK.



BRISTOL "BEAUFIGHTER" I

FT.

Manufacturers : The Bristol Aeroplane Co., Ltd., Filton, near Bristol. Also built by several other factories in Great Britain.

Purpose : Two-seat night fighter.

Power Plant : Two Rolls-Royce Merlin XX liquid-cooled Vee motors, maximum power (each) (low blower), 1,260 h.p. at 3,000 r.p.m. at 12,250 ft. ; (high blower). 1,175 h.p. at 21,000 ft. Two-stage supercharger.

Construction : Wings—All-metal two-spar structure in three main sections comprising the centre-section, which includes the motor mountings and passes through the fuselage where it is bolted, and the two outer panels which are attached just outboard of the motor nacelles. Main spars have single sheet webs and extruded flanges. Pressed sheet ribs and flush-riveted light aluminium alloy stressed-skin covering. Bristol-Frise type aerodynamically-balanced ailerons with fabric covering. Split trailing-edge flaps with metal covering in four sections with hydraulic operation. Fuselage—All-metal light alloy monocoque structure with "Z"-section transverse frames and extruded light alloy bulb-angle stringers with light alloy stressed-skin flush-riveted covering. Built in three main sections comprised of the nose, centre-portion including cockpits, and rear portion. Tail unit—Light alloy structure with aluminium alloy stressed-skin covered fin and tailplane and fabric-covered movable surfaces. Wooden tailplane tips. Undercarriage—Backwards-retracting type, the main wheels being completely enclosed by hinged doors when in the retracted position in the motor nacelles. Twin oleo-pneumatic shock-absorbing struts cross-braced to each wheel. Fixed tail-wheel. De Havilland Hydromatic constant-speed fully-feathering three-bladed metal airscrews.

Dimensions : Span, 57 ft. 10 in. Length, 41 ft. 8 in. Height 15 ft. 10 in.

Areas : Wings, 503 sq. ft.

Weights : Empty, 13,600 lb. Loaded, 20,290 lb.

Loadings : Wing, 46·2 lb./sq. ft. Power, 8·4 lb./h.p.

Tankage : Fuel, 550 gallons. Oil, 36 gallons.

Performance : Not released.

Armament : Four fixed 20 mm. (Oerlikon design and Hispano licence) shell-guns mounted in the nose and positioned so as to be easily accessible by the observer so that jams can be cleared, and six fixed Browning ·303 calibre machine-guns mounted in the leading-edge of the wings (four in the starboard wing and two in the port wing panel). The shell-guns fire at the rate of 550 rounds per minute and the machine-guns at 1,250 rounds per minute, so that the total weight of fire is 765 lb./minute. No rear armament.

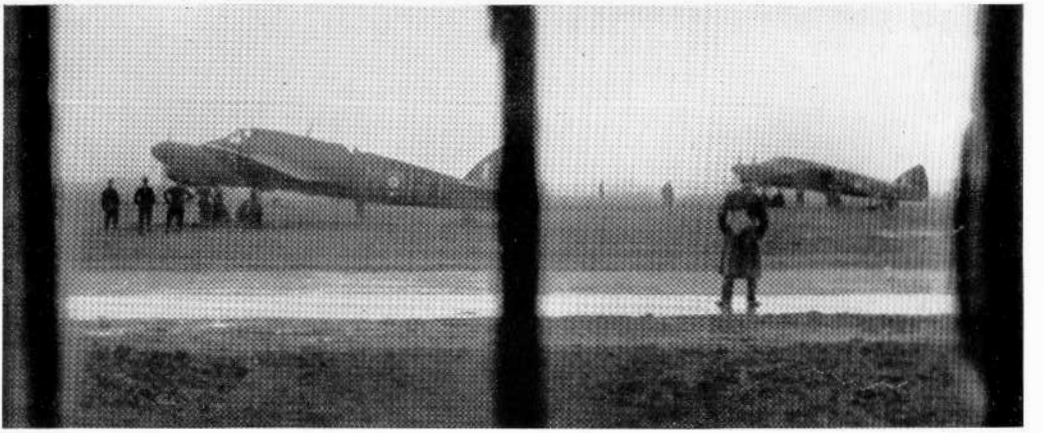


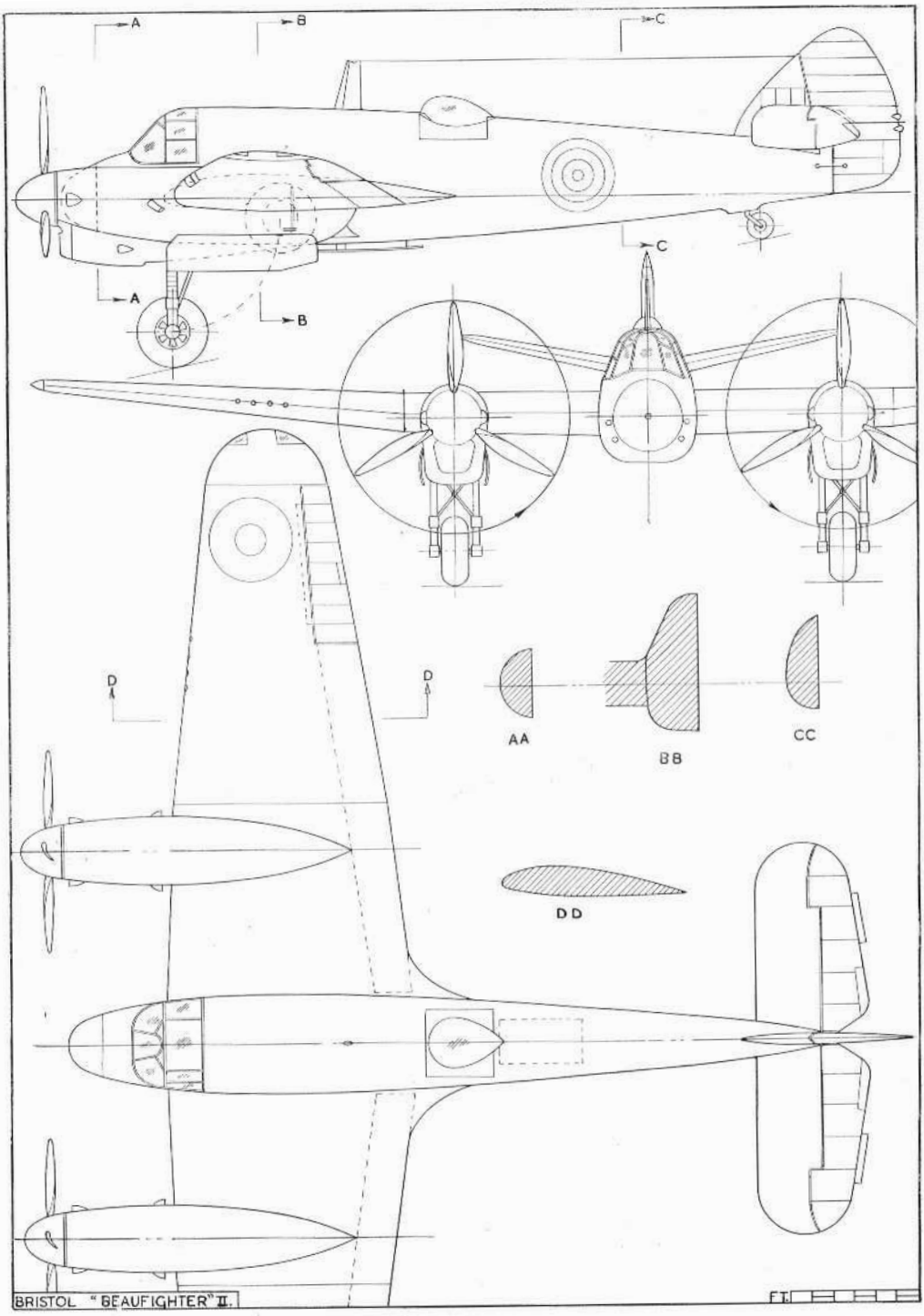
Photo by courtesy of the Air Ministry.

Night-flying squadrons of Fighter Command have been equipped with the latest version of the Beaufighter, the Mk. II, since early in 1942. It differs from the Beaufighter I in having twin Rolls-Royce Merlin XX liquid-cooled motors in place of the Bristol Hercules III sleeve-valve radial motors, but in all other respects is identical. The new motors increase the overall length by a few inches and alter the characteristic "sit" of the Beaufighter in side elevation particularly. The Merlin nacelles are underslung and precisely similar to the design fitted on the Lancaster I bomber. The sideways view from the pilot's cockpit is probably slightly improved on the Beaufighter II because the top line of the Merlin motor nacelle is rather lower than that of the Hercules.

The performance of the Beaufighter II has not been made known but it may be expected to be almost identical to that of the Mk. I which has a top speed of 330-340 m.p.h. at 14,000 ft. and a normal cruising speed of 200 m.p.h. The Merlin XX motors have two-stage superchargers like the Hercules III so that the performance at height does not suffer. The lower power of the Merlin in contrast to the Hercules is compensated by the decrease in drag afforded by the smaller frontal area of the Merlins. A slight saving in weight is achieved in the Beaufighter II as the Merlin XX only weighs 1,450 lb. compared with the 1,705 lb. of the Hercules III. This may contribute to a faster rate of climb.

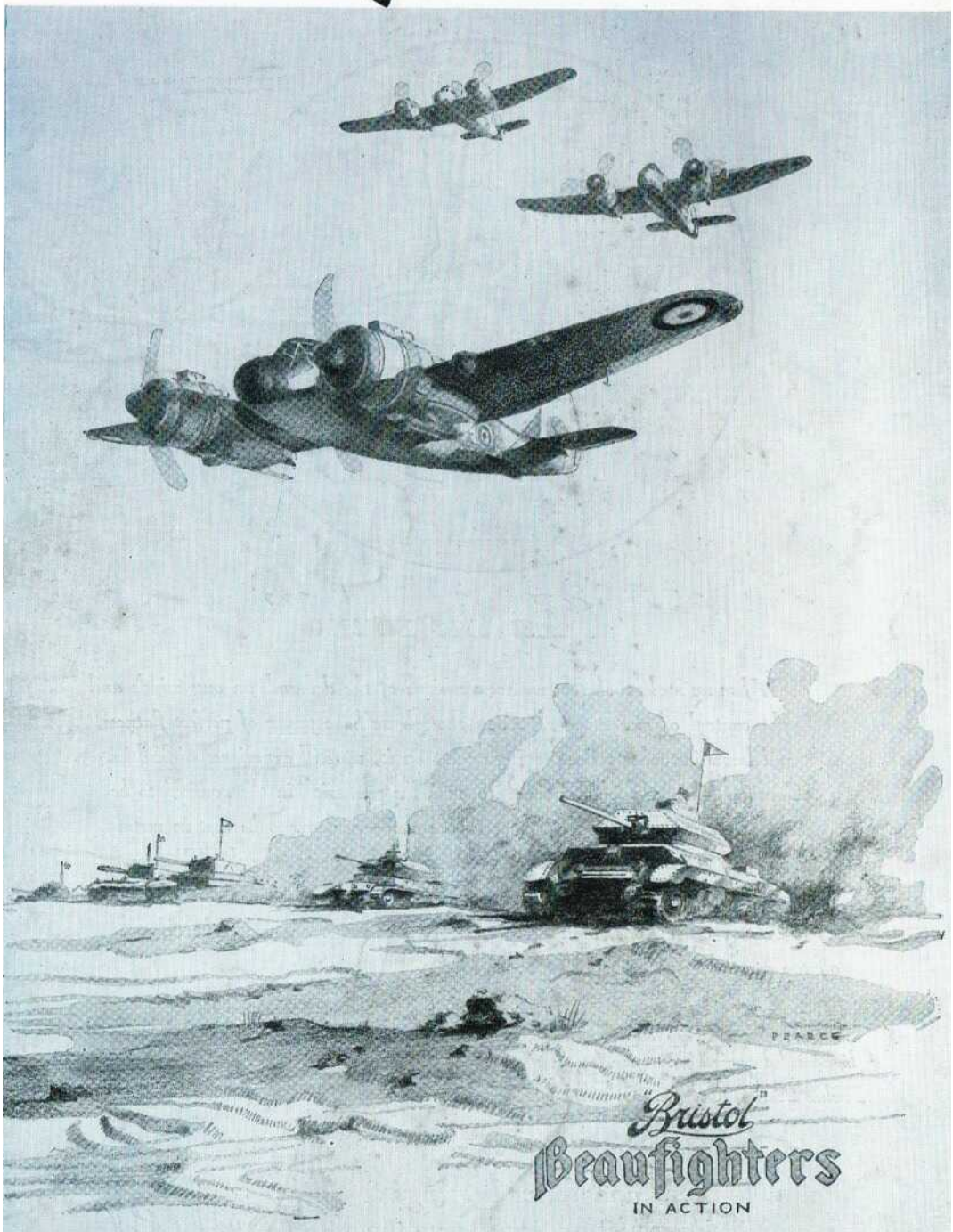
It is not believed that the Beaufighter II is in service overseas as is the Beaufighter I. It appears to be employed exclusively as a night fighter whilst the Mk. I is used both by the Coastal Command units and in the Middle East. Beaufighter Is have been very active throughout the summer of 1942 in the defence of Malta and the convoys which approach the island.

Certain of the night fighter squadrons now flying the Beaufighter II are units of the Royal Canadian Air Force with whom the type is very popular. These machines are painted entirely soot black and carry squadron letters and serial number in red. One Beaufighter II squadron carries the squadron code identification letters "HU" on the fuselage sides. Another night fighter squadron carries the letters "NG." All Beaufighters have recently been given dihedral tailplanes.



BRISTOL "BEAUFIGHTER" II.

FL



"Bristol" Beaufighters IN ACTION

THE BRISTOL AEROPLANE COMPANY LIMITED.