

NO. 427 SQUADRON FLIGHT ENGINEER SECTION

DRILL FOR USE OF FUEL TANKS

It is essential that all fuel tanks in the Lancaster aircraft are tested within a short time after take-off, to see that fuel can be drawn from either the No. 1 or No. 2 tanks. To ensure that this is done the appropriate drill as set out below is to be carried out on all flights.

- A. For No. 1 and No. 2 tanks in use.
- B. For No. 1, No. 2 and No. 3 tanks all full.
- C. For No. 1, No. 2 and No. 3 tanks, and the long range fuel tanks all full.

A. With No. 1 and No. 2 tanks in use.

(No. 1 and No. 2 tanks need not necessarily be full.)

1. Take-off

(i) Selector cock on No. 2 tanks.

(ii) No. 1 and No. 2 pulsometer pumps ON.

(iii) If petrol failure occurs on take-off, the Flight Engineer immediately turns the selector cocks to No. 1 tank.

2. When Airborne

At 2,000 feet switch off pulsometer pumps.

3. In Flight

(i) When 120 gallons of fuel have been used from each No. 2 tank, Flight Engineer informs Captain and changes selector cocks from No. 2 to No. 1 tanks. (This will be approximately one hour after take-off.)

(ii) Fly on No. 1 tanks for one hour. Check that fuel is being used from No. 1 tanks by observing petrol gauge readings.

(iii) After one hour Flight Engineer informs Captain that fuel system is correct and changes back to No. 2 tanks.

(iv) Continue to draw fuel from No. 2 tanks until each No. 2 tank has approximately 100 to 150 gallons left by the fuel gauge readings, then the Flight Engineer informs Captain and changes selector cocks back to No. 1 tanks.

(v) The 100-150 gallons left in the No. 2 tanks is only to be used for emergency.

B. No. 1, No. 2 and No. 3 tanks all full.

1. Take-off

(i) Selector cock on No. 2 tanks.

(ii) No. 1 and No. 2 pulsometer pumps ON.

(iii) If petrol failure occurs on take-off, the Flight Engineer immediately turns the selector cocks to No. 1 tanks.

2. When Airborne

At 2,000 feet, switch off pulsometer pumps.

3. In Flight

(i) When 120 gallons of fuel have been used from each No. 2 tank, Flight Engineer informs Captain and changes selector cocks from No. 2 to No. 1 tanks. (This will be approximately one hour after take-off.)

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- (ii) Flight Engineer then switches on No. 3 tanks pulsometer pumps, transfers fuel from No. 3 tanks to No. 2 tanks. Flight Engineer checks that fuel is being transferred by watching No. 3 and No. 2 tank gauges. Flight Engineer also checks fuel is being used from No. 1 tank by checking gauges.
- (iii) When No. 3 tanks are empty, switches off No. 3 pulsometer pump switches and changes selector cock from No. 1 to No. 2 tanks. Continue to use No. 2 tanks until 100 to 150 gallons are left in each No. 2 tank. When Flight Engineer informs Captain and switches selector cocks back to No. 1 tanks for the remainder of the flight.
- (iv) The 100 to 150 gallons left in No. 2 tanks are only to be used in emergency.

C. No. 1, No. 2 and No. 3 tanks, and the Long Range Fuel tanks.

1. Take-off

- (i) Selector cock on No. 2 tanks.
- (ii) No. 1 and No. 2 pulsometer pumps ON.
- (iii) All master fuel cocks on.
- (iv) If petrol failure occurs on the take-off, the Flight Engineer immediately turns the selector cocks to No. 1 tank. Pilot makes immediate landing at his base after lightening the aircraft to 55,000 lbs.

2. When Airborne

- (i) At 2,000 feet switch off immersed fuel pumps.
- (ii) After thirty minutes flight, change to No. 1 tanks.
- (iii) When sufficient fuel has been used from No. 1 tanks to equal the amount carried in the long range tanks (i.e., if the two tanks are fitted 400 gallons must be used from each No. 1; if one long range tank is fitted 200 gallons must be used from each No. 1 tank), then change to No. 2 tanks.
- (iv) Having changed to No. 2 tanks start pumping the contents of the long range tanks into the No. 1 tanks. The correct sequence of this is:-
- (a) Turn on both long range fuel cocks situated behind the front spar.
 - (b) Switch on the pump switches and fuel contents gauges.
 - (c) When the pulsometer pumps are switched on the petrol immediately starts to flow into No. 1 tanks and it will take approximately 60 minutes to transfer the whole fuel load either the 400 or 800 gallons.
 - (d) During the pumping process a careful watch must be maintained on the fuel contents of gauges of No. 1 tanks to ensure that the petrol is being transferred evenly to both No. 1 tanks. In the event of one No. 1 tank being filled before the other the long range fuel tank cock to No. 1 tank that is filled first is to be turned off, thus allowing all the flow to go to the other No. 1 tank.
- (v) While the fuel is being transferred from the long range tank of No. 1 tanks, the aircraft will be flying on its No. 2 tanks and as the fuel transfer will take at least 60 minutes the No. 2 tanks will be sufficiently emptied to allow for transfer of the No. 3 (Outer) tanks to the No. 2 tanks. Accordingly, as soon as the long range tanks are emptied the petrol is to be transferred in the normal manner from No. 3 to No. 2 tanks. This means that after the aircraft has been airborne from 5 to 5½ hours the No. 1 tanks will be full and the No. 2 tanks will be topped up from the No. 3 tanks, i.e., after 5½ hours the aircraft will have full No. 1 and No. 2 tanks.

LANCASTER Mk. I and III DRILLS

I - DRILL TO BE CARRIED OUT IN DISPERSAL

A. PRE-STARTING DRILL

1. See that checks are in place, Pitot head, static vents, cockpit and wheel covers removed. Check tyre creep and landing edges screwed down.
2. Sign Form 700 and fuel state. Note distribution of fuel in various tanks.
3. Enter aircraft and check:-
 - (a) Pirouan's amp and first aid kits are in position, all hatches closed & secure.
 - (b) Flame floats and equipment properly stowed.
 - (c) Oxygen main cock "ON".
 - (d) Check oxygen air bottle, normal pressure 1200 lbs. for Darulius or two steel bottles.
 - (e) Check hydraulic accumulator, static pressure 220 lbs.
 - (f) Turn main switch to "FLIGHT".
 - (g) Check petrol, cross feed cock "OFF" and all idle cut off switches "OFF" "DOWN" with Lancaster III and Merlin 28 engines.
 - (h) Switch fuel contents gauge "ON" and check fuel contents.
 - (i) Test fuel pumps by ammeter one at a time.
 - (j) Main fuel cocks to No. 2 (Centre) tanks "ON".
 - (k) Turn on master fuel cocks for Lancaster I, but leave all cocks "OFF" for Lancaster III with Merlin 28.
 - (l) Leave master cocks and Nos. 1 (Inner) and Nos. 2 (Centre) fuel pumps "ON" for Lancaster I. Leave all master cocks "OFF" for Merlin 28 engines.
 - (m) Test trimming tabs control movement.
4. The Flight Engineer will then read out from the check list, the pilot will report as each check is carried out:-
 - (a) Adjust rudder pedals to suit length of leg and ensure pedals are adjusted evenly.
 - (b) Test that full rudder to port and starboard can be applied from normal sitting position without extending legs fully.
 - (c) Test all controls for full movement and put automatic pilot "IN".
 - (d) Brakes "ON" (Note pressure Min. 120 lb/sq. for Lancaster III.)
 - (e) Cold air.
 - (f) Bomb doors "CLOSED".
 - (g) Mixer box to I/C position.
 - (h) Flap gauge and indicator lights switch "ON".
 - (i) Set altimeter to "ZERO".
 - (j) Pitch controls "FULLY FINE".
 - (k) Supercharger in M ratio.
 - (l) Flap cover "NEUTRAL".
 - (m) Undercarriage lever locked "DOWN".
 - (n) Main switch to "GROUND".

B. STARTING AND RUNNING UP DRILL

1. When Pilot or Engineer is ready for starting he will give the order "READY FOR STARTING".
2. N.C.O. i/c starting crew:- "UNDERCARRIAGE LOCKED DOWN"
"BRAKES ON"
"SWITCH TO GROUND".
3. Pilot or Engineer reports back each item as checked.
4. Ground crew then prime with K1 gas.
Ground crew:- "ALL CLEAR - CONTACT STARBOARD OUTER".
Pilot or Engineer:- "CONTACT STARBOARD OUTER".
5. The Flight Engineer switches "ON" the booster coil, main ignition switch and with Lancaster III turns on the Master fuel cock of engine to be started, and he then presses the starter button. For starting Merlin 28, when engine fires and starts running, and not before, snap "UP" the idle cut off switch. Do NOT pump throttle on Merlin 28 engines.

In the day time,

The N.C.O. 1/o ground crew will stand in a position where he can be clearly seen by the Pilot and indicate when an engine is ready for starting by giving "Thumb up" with one hand and pointing to the engine with the other.

At night

The ground crew will indicate when an engine is ready for starting by flashing a white torch in a rotary motion from the priming position.

6. The Flight Engineer is to check oil pressure as each engine is started. The Pilot controls the throttle until the engine starts then opens up to 1200 revs.
7. When all the engines are running the Flight Engineer is to:-
 - (a) Switch "OFF" the booster coil.
 - (b) Tell W/O to turn main switch to "FLIGHT". W/O to repeat "SWITCH TO FLIGHT" when this is done.
 - (c) Check oil pressure.
8. The Pilot then (1) switches the D.R. compass to "SETTING" and (2) tests flaps.
9. When each Engine is warmed up (oil temp. 15°c. Coolant 60°c)

Flight Engineer: "Starboard outer O.K. for run up."
Pilot: "Running up starboard", then

 - (a) Test mags. for dead cut at warming up revs (1100, must be done quickly.)
 - (b) Open throttles to take off boost plus9 (opening up to plus14 which is through the gate, will normally be confined to test for an operational or full load take-off.)
 - (c) Test magnets at plus9 Boost. Note drop in revs., not more than 150.
 - (d) Throttle back to 0 boost and check operation of 2 speed blower.
 - (e) Also at 0 Boost, check operation of O/S unit.
 - (f) Snap back at last 3/4" to test slow running.
10. On completion:- Flight Engineer:- "All engines O.K."
Pilot:- Repeats.

B.S. RUNNING UP WITH A PLUS14 lbs BOOST

- (1) Running up to plus14 lbs Boost is to be confined to a test for a take-off when A.U.W. exceeds 61,500 lbs.
- (11) Open throttle through gate position for test not longer than 2 seconds. Plus14 Boost through gate, only applies to operational aircraft.

C. INTERCOMM. CHECK

The Captain is to call each member of the crew who will report on his equipment as follows:

CAPTAIN

"Pilot" (if not Captain)
"Air Bomber" (if not Captain)

"Navigator" (if not Captain)

"W/O/AG"

"Mid Upper Gunner"

"Rear Gunner"

CREW MEMBER

"Engines O.K. Oxygen connected."
"Photo loads O.K. Camera isolation switch "ON".
"Bomb selector Nos. O.K. Feed clear. Oxygen connected. 1/3 O.K. when turret rotated."
"Instruments and lights O.K. 'GEM' not 'OFF'. Oxygen connected."
"Wireless O.K. Batteries charged. Spare batteries O.K. Oxygen connected."
"Turret elevation and rotation O.K. Feed clear. Oxygen connected. Heated clothing O.K. 1/3 O.K. when turret rotated."
"Turret elevation and rotation O.K. Feed clear. Oxygen connected. Heated clothing O.K. 1/3 O.K. when turret rotated."

II - LANCASTER TAXIING DRILL

1. When taxiing in the dark, always have the Flight Engineer or Air Bomber with the Aldis lamp available to shine on the taxi track ahead of the A/C.
2. When leaving dispersal the Flight Engineer is to check on the right hand side. The Rear Gunner is to maintain a careful check from his turret to warn Pilot of (a) overtaking aircraft, and (b) if the tail is getting too close to the edge of the taxi-strip, particularly at turns.

III - TAXIING POST CHECK.

The Drill is, Trim, Flaps, Pitch, Friction Nut, Fuel, Supercharger and Cut Out, George, and Bomb Doors and is to be memorised by Pilot and Flight Engineer. The Flight Engineer is to check Pilot as each adjustment is made.

1. T. Trimming Tabs.
2. Flaps - 15° light, 25° heavy load.
3. P. Pitch (fully fine).
4. F. Friction Nut just holding.
5. Fuel - All master cocks "ON". Selector cocks No. 2 for immersion pumps. No. 1 (inner) and No. 2 (Outer) immersion pumps "ON".
6. Supercharger - in "M" Ratio.
7. (X) Boost Control cut out in "DOWN" position. Ensure spring loaded catch is right home.
8. George spin control "OUT"
9. Bomb doors closed.

NOTE . Care must be taken to avoid returning the Boost Control Cut Out to the normal "UP" position by inadvertently tripping the spring loaded catch with the knee.

Flight Engineer:- "Engine temperature and pressure O.K.
Pitot heater "ON" (or "OFF")."

X .No. 7 is to be used only if all up weight of the aircraft exceeds 61,500 lbs. and engines are modified for plus 14 lbs. boost.

IV - TAKE OFF DRILL.

The Pilot will have his microphone mask secure in position and the microphone switch "ON".

The Flight Engineer will repeat all orders given by the Pilot but will not make the executive action until after a distinct pause. This pause gives the pilot an opportunity to check the repetition or to cancel his order in emergency.

When in position to take off, the Pilot will -

- (1) Check navigation lights (on or off as ordered).
- (2) Set Directional Gyro to 0.

Pilot	F/E	Fusag	Action by:	Action
"Running UP".	Running UP"	-	Pilot	Open throttles against brakes to zero boost to clear engines.
"O.K. for take off"	"O.K. for take off"	-	F/E	Check engine gauges. Looks out on starboard side.
"taking Off"	-	-	Pilot	Releases brakes and opens throttles slowly to the gate to plus 9 lbs (or plus 12 boost which ever is applicable. Emergency plus 14.)
"Full Power"	-	-	F/E	Checks all four boost and rev. gauges for plus 9 and 3000 R.P.M. (or for plus 14 lbs and 3000 R.P.M.) Screws throttle friction nut to finger tightness.

<u>Pilot.</u>	<u>F/E</u>	<u>Pause</u>	<u>Action by:</u>	<u>Action</u>
"Full Power"	-	-	F/E	Watches all fuel pressure warning lights. If light shows turn appropriate cock to other tank.
			Nav.	Starts calling airspeed every 3 seconds as soon as speed reaches 70 m.p.h.
at 100 ft. or over the aerodroms boundary.				
"Wheels Up"	"Wheels Up"	-	F/E	Selects wheels "UP"
"Climbing Power"	"Climbing Power"	-	F/E	Reduces revs to 2850 and boost to plus 7. Reduces to 2650 +7 at 300 ft.
"Flaps UP"	"Flaps UP"	-	F/E	Selects flaps "UP"
"Cruising Power"	"Cruising power"	-	F/E	Throttles to plus 4 boost. Reduces revs to required setting.
-	-	-	Pilot	D.R. Compass to "NORMAL" after 5 mins., Flight.
-	-	-	F/E	On reaching 1000 ft. switch off immersed fuel pumps.

V - LANCASTER LANDING DRILL.

NOTE. Set Gyro at "0" when on magnetic bearing of runway in use. Set D.R. repeater to Q.D.M. of runway. Set Q.P.E. on altimeter at night. Enter circuit at 160 m.p.h. I.A.S. with 20° of flap applied if necessary.

- Check :- (1) George clutch "OUT"
 (2) Air intake "COLD"
 (3) Supercharger "M"
 (4) Telling aerial "IN"

<u>Pilot</u>	<u>E/E.</u>	<u>Pause</u>	<u>Action By:</u>	<u>Action.</u>
"Prepare to land"	"Prepare to land"	-	E/E	Putts No. 1 and No. 2 Immersion or Pulsometer pump "ON". Selects No. 1 tank or tanks containing most fuel when there is little petrol left. Supercharger in "M". Brake pressure not less than 150lbs sq. in 105 lbs minimum permissible, but flying Control to know in such circumstances.
<u>When on the Downwind leg.</u>				
"Wheels Down"	"Wheels Down"	-	E/E	Selects wheels down, checks two green lights.
	"Wheels Locked Down"		Pilot	Trims aircraft after wheels are down.
"Flaps 20"	"Flaps 20"	-	E/E	Selects 20° Flaps.
	"20 Flap ON"		Pilot	Trims aircraft after flaps are down 20°.
"2650"	"2650"	-	E/E	Selects 2650.
<u>CROSSWIND.</u>				
"Flaps 30"	"Flaps 30"	-	E/E	Selects 30° Flap.
	"30° Flap ON"		Pilot	Trims aircraft after flaps are down 30°.
"Airspeed"	"On"	-	Nav.	Calls airspeed every 3 seconds until landed.
			Pilot	Turns into runway outside outer funnel and through outer funnel at 600-750 feet dependent on wind strength.
"Flaps Revs"	"Flaps Revs"	-	E/E	Selects Flaps fully down, puts revs up to 2850.
			Pilot	Trims aircraft after flaps are down.
	"Flaps fully down"			

After throttling back for actual landing E/E checks momentarily that throttles are fully closed, but does not hold on to throttle levers.

After landing.

<u>Pilot</u>	<u>E/E</u>	<u>Pause</u>	<u>Action by:</u>	<u>Action</u>
			Pilot	Taxies clear of flare path.
			E/E	Moves inspection lamp to show additional white light to rear.

Pilot	E/E	Pause	Action By:	Action
"Flaps Up"	"Flaps Up"	-	E/E	Selects flaps up.
			E/AG	Ascertain all clear behind and states "All clear behind".
			E/E	Checks brake pressure again.
"Aldis Lamp"		-	E/E	Couples lamp and directs it as necessary on runway and taxi track until at least 150 yards clear of runway in use.

VI. - LANCASTER MISLANDING DRILL.

Pilot	E/E	Pause	Action by:	Action
"Going round again"	"Going round again"	-	Pilot	Throttles open to plus 9 boost.
			Rev.	Calls airspeed every three seconds.
			E/E	Checks boost and rev. gauges and tightens friction nut.
"Wheels up. Flaps 40."	"Wheels up. Flaps 40"	-	E/E	Selects wheels up and takes off flap to 40°.
At 500 feet.				
"Climbing power"	"Climbing power"	-	E/E	Reduces revs to 2650 plus 7 boost.
"Flaps up"	"Flaps up"	-	E/E	Selects flaps fully up. A LITTLE AT A TIME.
"Cruising Power"	"Cruising power"	-	E/E	Throttles back to plus 4 and reduces revs to required setting.

VII. - STOPPING ENGINES.

<u>Pilot</u>	<u>F/E</u>	<u>Pause</u>	<u>Action by:</u>	<u>Action</u>
"Rad Flaps"	"Rad Flaps"	-	F/E	Open rad. flaps.
"Mag Check"	"Mag Check"	-	Pilot	Opens up each engine in turn to plus 4 and checks mag. drop.
			F/E	Watches rad. temp. and oil pressure.
"Mags O.K. (or otherwise)"	"Temperatures and pressures O.K. (or otherwise.)"			
"Switching Off"	"Switching Off"	-	F/E	Cuts master fuel cocks, Ignition switches off, or for Merlin 28, (1) Throttle back to 800 revs. (2) Put idle cut offs down. (3) Switch off ignition.
			Pilot	Checks that D.R. Compass off, Flaps indicator off, \sqrt{C} lights off. TR 1196 off. Main fuel cocks off. S.B.A. off. Lights off. Main switch to "ground".

VIII. - PROPELLOR FEATHERING AND UNFEATHERING DRILL.

NOTE: When once a propeller has been feathered because of engine trouble, it is NOT to be UNFEATHERED under any circumstances. This order does not apply when a propeller is unfeathered for training crews in feathering drill.

A. To feather a propeller.

<u>PILOT</u>	<u>ACTION BY:</u>	<u>ACTION</u>
"Feather (Starboard outer) engine"	F/E	Close master cock for (Starboard Outer) engine, then press feathering switch and ensure solenoid is holding the button in before releasing. Switch off ignition after engine has stopped.

In the case of Lane, III (Merlin 28) \sqrt{C} , the first action by the Engineer is to put the respective idle cut off switch to idle cut off position; then carry on with normal drill.

NOTE:

Care must be taken at night to press correct feathering button and to turn off correct master fuel cock.

As engine stops stand by ready to pull out feathering button, in case it sticks in when feathering operation is completed.

"B". To Unfeather the propeller.

<u>PILOT</u>	<u>ACTION BY:</u>	<u>ACTION</u>
"Unfeather (Starboard Outer) engine".	F/E	Sets constant speed lever to course (down). Switches on ignition.
	Pilot	Opens throttles one inch.
	F/E	Press feathering button and hold until R.P.M. rise to 1500 r.p.m. and not more than 1800, then release button. Ensure button springs out when released. Opens master fuel cock, (Starboard outer) engine. Switch on I.C.O. to running position in Lane III Merlin 28.

<u>PILOT</u>	<u>ACTION BY:</u>	<u>ACTION</u>
	E/E	Checks engine temperatures and oil pressures correct before bringing r.p.m. and boost in line with outer engines.

NOTE When unfeathering, if the propeller goes to full fine pitch and gives excessive r.p.m. the following procedure is to be adopted.

<u>PILOT</u>	<u>ACTION BY:</u>	<u>ACTION</u>
	Pilot	Close throttle of over revving engine Reduce air speed.
	E/E	Set propeller speed control of over-revving engine fully forward, i.e. maximum r.p.m.

NOTE The propeller will return to normal constant speed operation when r.p.m. are reduced below the setting of the propeller speed control.

IX. - DRILL FOR FIRE IN AN ENGINE IN THE AIR.

- As soon as the fire is detected, the crew member seeing it will call the Captain.
 - The Captain will at once:-
 - Warn the crew.
 - Order the Pilot and Flight Engineer to carry out feathering drill on the engine concerned.
 - When the engine has stopped and not before, the Flight Engineer is to operate Gravinor Fire Extinguisher button for the engine.
 - Do not attempt to restart engine when fire has been put out.
 - If fire persists after fire extinguisher has been used, Captain gives orders to prepare to abandon the aircraft.
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MARK VIII AUTO PILOT

SEQUENCE OF OPERATIONS

1. Immediately prior to take-off, check that the clutch lever is in the "IN" position.
 - (a) Move the stick fore and aft, and the ailerons left and right to extremities of travel to ensure clutches are engaged.
 - (b) With engines running, and 60 lbs. per square inch on the pressure gauge, check that the control surfaces are free in "SPIN" and "OUT" positions of control cock.
 - (c) Return control cock to "OUT"
 - (d) Switch on D.R. Compass.

2. ENGAGING THE CIRCLES

- (a) As soon as convenient, after the take-off, set the control cock to "SPIN". After not less than 5 minutes with the cock in this position, the auto pilot is ready for use.
- (b) Set the pitch control to the desired pitch attitude of the aircraft.
- (c) Trim aircraft, "Hands and feet off" at the desired airspeed and course. Rudder trim is most important.
- (d) Set the pointer of the pilot's repeater parallel with the grid or lubber line.
- (e) Set the "Control Switch" to "Compass".
- (f) Move the control cock to "IN".

If it is found that a first cutting in the stick kicks back, subsequent engagement may be accomplished more comfortably as follows:-

While in "SPIN" and ready to engage, trim "Hands off" as before, and then put the aircraft into a shallow drive, then ease the stick back so that it is further back than its normal trimmed position, and out "IN" as the aircraft reaches level flight.

If the kick was at first forward, climb the aircraft slightly and then ease the stick forward past its normal trimmed position, and out "IN" as the aircraft reaches level.

The above must involve slow and small manoeuvres only.

If the aircraft does not fly laterally level, adjust rudder trim.

If left wing low, trim on left rudder.

If right wing low, trim on right rudder.

If the trim is adjusted in low wing swerve, the low wing will be depressed further.

GENERAL OPERATIONS

- (a) Course-Changing, Slow Small changes of course may be made with the control switch at "Compass", by resetting the pointer of the pilot's repeaters.
- (b) Course-Changing, Fast Set the repeater pointer to the new course, and then turn the control switch to "jink". A banked turn will develop. When the aircraft is about 10° short of the desired course, return the control switch to "compass".

During a fast trim it will be necessary to keep the aircraft's nose up, by adjustment of the pitch control, returning the control to its original setting as the turn comes off.

CHANGE OF FORE AND AFT ATTITUDE The fore and aft attitude of the aircraft whilst under Auto Control can only be altered by means of the pitch control. ON NO ACCOUNT IS THE MANUAL TRIMMER TO BE USED TO CHANGE ATTITUDE.

IMMEDIATELY PRIOR TO LANDING:

- a) Control Cock to "OUT"
- b) Control Switch to "OFF"

P.T.O.

FINAL INSTRUCTIONS:

1. Do not forget to check that clutches are engaged before take-off.
2. Do not forget to allow 5 minutes in "GRIN".
3. Do not disengage clutches in the air.
4. Do not use the manual elevator trimmer to change attitude. It may be used, however, to compensate for changes of trim by adjusting when the differentially operated pointer on the pressure gauge is flickering between the red and green section.



LANCASTER MK. I AND III

AUXILIARIES BREWED BY EACH ENGINE.

Port Outer:

- (a) Hydraulic pump for operating the Rear turret. Mounted on the Rear of the "S.T.B.D. Cylinder Block.
- (b) An alternator for 'OIE' mounted on the Port Side of the Engine.

Port Inner: one 1500 watt generator for the Main Electrical system

- (a) Mounted on the Port Side of the Engine.
- (b) Hydraulic pump for operating the Mid-Under turret. Mounted on the Rear of the S.T.B.D. cylinder Block.
- (c) One main Hydraulic pump which operates the (1) Flaps (2) Under-Carriage (3) Bomb Doors (4) Carburettor Air Intake Shutters. And also charges the hydraulic Accumulator (which is situated port side of the fuselage rear of the front Spar). The pump is situated underneath the engine forward of the oil pressure pump.
- (d) One PESCO Vacuum pump which supplies the Section to the Main Instrument Panel. Mounted on the front of the engine S.T.B.D. side opposite the C.S.U.
- (e) An R.A.E. compressor for operating the Automatic Controls (George). Mounted on the Rear of the Port Cylinder Block.

S.T.B.D. Inner:

- (a) One 1500 watt generator for the "Main Electrical System mounted on the port side of the Engine.
- (b) An Hydraulic pump for operating the front turret mounted on Rear of the "S.T.B.D." cylinder Block.
- (c) One main Hydraulic pump situated as on the 'Port Inner' and operate the same services.
- (d) One PESCO Vacuum pump which supplies the section to the main instrument Panel. And the Bomb Sight mounted on the front of the Engine 'S.T.B.D.' side opposite the C.S.U.
- (e) Heywood type Compressor mounted on the Rear of the 'S.T.B.D. Block for the Pneumatic System which operates the following:
Service:-
 - (1) wheel Brakes
 - (2) Radiator Shutters (Thermostatically controlled with overside switch incorporated)
 - (3) The idle cut-out jack. (Merlin 28 & 38 only)

S.T.B.D. Outer:

- (a) Hydraulic pump which operates the mid-upper turret mounted on the Rear of 'S.T.B.D.' Cylinder Block.
- (b) An Alternator for OIE. Mounted Port Side of the Engine.