NORMAL OPERATING PROCEDURES

ENGINE STARTING PROCEDURE - NOTES CTD

33/ Engine oil pressure rise will ordinarily be noted before light-off. If there is no rise before engine speed has reached 5000 RPM, discontinue start.

34/ Fuel Pump lights on the center overhead starting panels should be: 0-2200 RPM - OFF; 2200-9000 RPM - ON; above 9000 RPM - OFF.

35/ The STARTER Button should pop out in the engine speed range of 8000-9000 RPM, and the overspeed light may flicker as the starter declutches from the engine. If the button does not pop out at the proper time, the Captain should pull it out manually. If starter overspeed light stays on, the engine should be shut down immediately.

36/ Engine Oil Presaure..... 50-75 PSI
Red. Gear Oil Pressure..... 50 PSI MIN.
Oil Temperature..... 60-100°C.

NOTE: On cold days, throttle should be kept in Start position until oil temperature has risen to 0°C. In warming up oil, not more than 1000 HP should be used while oil temperature is in 0-60°C temperature range.

Compressor Oil Temperature. 60°C.
Compressor Oil Pressure.... 100 PSI.
Fuel Pump (Engine Booster)
Low Pressure Warning
Light..... OFF.

37/ If Generator #4 voltage is normal, the Pilot will turn the External Power Switch OFF and check the annunciator lights to see that Generator #4 picks up electrical loads. At this time, FREON switch may be put to the AUTO position and the air conditioning FAN switch may be put to the AUTO position, to restore utilization of the airplane's air conditioning equipment.

Ground crew can determine that flight crew has shifted from external power to use of #4 generator by means of "External Power In Use" light (under fuselage) having extinguished. This permits them to disconnect the AC power cable and stow it on the ground power unit while other engines are being started to hasten their ability disassociate ground equipment from the plane and speed departure.

38/ After starting Engine 3, Captain will advise ground crew via interphone, "Disconnect Air" and remainder of engines will be started with bleed air derived from the others.

CAUTION: DO NOT MOVE THE RPM SWITCH OR THROTTLE OF ANY ENGINE WHILE IT IS BEING BLED FOR ENGINE STARTING PURPOSES.

39/ If there is to be a delay in starting engines #2 and #1, the flight crew should remember to put the Starter Selector to its OFF position, and hold oil cooler switches #3 and #4 to OPEN for 10 to 15 seconds after oil coolers full open, in order that the inducers will be full open for oil cooling purposes, if ambient temperatures are such that this is required.

NORMAL OPERATING PROCEDURES

CAPTAIN	PILOT	ENGINEER
	BEFORE TAXIING	
	40/EXT. POWER SW.....OFF	
	41/INVERTER.....EMER	
STARTER SELECTOR.....OFF		
42/BLEED VALVES.....CLOSED		
43/WINDSHIELD HEAT.....LOW		
	44/AC HYD. PUMPS #1&1A...NORMAL	
	DC HYD. PUMP (TOW SW.)...OFF	
	45/HYD. PRESS.....CKD.	
	DOOR WARN. LTS.....OUT	
		46/FIRE WARNING.....CKD.
		47/OIL COOLERS.....SET
GEAR PINS.....CKD.		
	***TAXIING AND BEFORE TAKE-OFF**	
FLIGHT INSTRUMENTS.....CKD.	FLIGHT INSTRUMENTS.....CKD.	
48/TRIM TABS.....SET		FUEL PUMPS.....ON
CONTROLS.....FULL TRAVEL		
ANTI-COLLISION LT...AS REQD.		
49/PITOT HEATERS.....AS REQD.		
50/ENG. & PROP ANTI-ICE.....AS REQD.		

NORMAL OPERATING PROCEDURES

BEFORE TAXIING - NOTES

40/ This switch is normally turned off immediately after starting #4.

41/ In event of AC Essential Bus becoming de-energized, this switch being in EMERG position will result in inverter automatically turning on and supplying AC power to T.I.T. circuits, Captain's Vertical Gyro, Captain's Horizon, and Captain's Turn and Bank.

42/ This includes Bleed Air Valves on Starting Panel only. Fuselage Bleed Air Shut-off Valves on Airfoil Ice Panel should remain in the OPEN and NORMAL position.

43/ The use of LOW power is recommended as routine in dry flight regardless of altitude or ambient air temperature. When ambient air temperature is less than standard, it is desirable that windshield anti-icing system switches be placed to LOW position at least 10 minutes prior to take-off in order for heat to penetrate vinyl layer and thicker inner sheet of glass.

NOTE: If cycling light does not come on, heating has not started, probably because the windshield is so cold that high thermistor resistance prevents application of the heating power. To initiate heating, maintain pressure on reset switch until release does not result in cycling light going off.

44/ It is EAL policy to use two AC Hyd. pumps in the No. 1 system during ground operation, with AC Hyd. pump for No. 2 system turned off. This provides two pump reliability of No. 1 Hydraulic System, and reduces electrical load on No. 4 generator when engines operating at LOW GROUND IDLE RPM.

45/ No. 1 Hydraulic System pressure and Brake Accumulator pressure should be approximately 3000 PSI.

46/ Fire Warning Bell--OFF, push Fire Detector test switches of engines #1, 2 and 3 to TEST position; inspect to see that lights illuminate for these three engines on glareshield fire warning panel; Fire Warning Bell--NORMAL, push Fire Detector test switch, engine #4 to TEST position; inspect to see that #4 Fire Warning Lights illuminate, and check that Fire Warning Bell rings. This check made at ORIGINATING STATIONS.

47/ The electrical circuits are such that the Engine Start Selector must be in the OFF position in order for bleed air to be routed to the inducers to provide adequate cooling air flow through oil coolers. After Engine Start Selector in OFF position, it will be necessary to hold oil cooler flap switches to OPEN (for 10 to 15 seconds after oil cooler flaps full open) to cause inducers to go to full open. In cold weather, oil coolers should be closed and throttles kept in the Start position until oil temperature has reached 0°C; thereafter, 1000 HP may be used to warm up oil between the temperature range of 0-60°C.

TAXIING AND BEFORE TAKE-OFF-NOTES

*The Captain should call for the taxiing and before take-off check list soon after leaving the ramp so it can be as nearly completed as possible on reaching the take-off area.

48/ Trim Tabs: Elevator 10° nose up, Aileron 0°, Rudder 0°.

49/ Set just prior to take-off.

50/ Turn on Engine and Propeller Anti-icing for take-off if OAT is 2°C (36°F) or lower and visible moisture is present in the atmosphere. Under these conditions, airplane gross weight should not exceed the figure specified in the Gross Weights Manual on the line entitled "If engine anti-icing system is used weight must not exceed". Should engine anti-icing be used at a temperature higher than 36°F, it will be necessary to reduce the gross weight indicated by 400 pounds per degree ambient temperature exceeds 36°F.

NORMAL OPERATING PROCEDURES

CAPTAIN	PILOT	ENGINEER
TAXIING AND BEFORE TAKE-OFF CTD		
	AC HYD. PUMP SYS. #2.....ON PRESS.CKD.	
	49/WING FLAPS.....TAKE-OFF	
	51/V_1-V_2 .....CKD.	
		49/AUTO FEATHER.....ARMED
		PRESS & TEMPS.....NORMAL
53/RPM SWITCHES.....HIGH		49/52/OIL COOLERS.....SET
TAKE-OFF		
54/ADVANCE THROTTLES TO APPROXIMATELY TAKE-OFF POWER, AND 55/ORDER TAKE-OFF POWER.		54/EVENS UP AND ADJUSTS POWER SETTING, AND QUICKLY MOVES ARM OUT OF WAY SO AS NOT TO INTERFERE WITH USE OF FLAP LEVER AND RADIO CONTROLS.
56/STEERS WITH NOSEWHEEL DURING INITIAL TAKE-OFF ROLL.	CALL OUT V_1-V_2 SPEEDS AS THEY ARE ATTAINED DURING TAKE-OFF RUN.	
57/LIFTS NOSEWHEEL SLIGHTLY OFF GROUND AT V_2 MINUS 5 KNOTS.		
LIFTS PLANE OFF GROUND AT V_2 AND ORDERS "GEAR UP".	REPEATS "GEAR UP" AND RETRACTS GEAR.	
58/ORDERS "FLAPS UP" AND POWER REDUCED TO METO.	REPEATS "FLAPS UP" AND RETRACTS FLAPS.	58/WHEN CAPTAIN ORDERS METO POWER, REPEATS ORDER, AND MAKES POWER REDUCTION. DO NOT KEEP HAND ON THROTTLES LONGER THAN NECESSARY TO MAKE THIS REDUCTION.

NORMAL OPERATING PROCEDURES

TAXIING AND BEFORE TAKE-OFF-NOTES CTD

51/ V_1-V_2 speeds may be determined from charts kept in cockpit with check lists. These charts are reproduced on page 3, Section 3-1 of this manual. Permissible weight for the runway to be used may be determined from EAL Gross Weights Manual, a copy of which is also kept in the cockpit of each EAL airplane.

52/ Set Oil Coolers to "Faired" position for take-off.

53/ RPM selector switches No. 1, No. 2, and No. 3, should be put to "NORMAL" (high), and advisory lights should be observed to determine that each generator picks up respective electrical bus(es). Then, put RPM selector No. 4 to "NORMAL" (high).

Instances have been known wherein the 5th and 10th stage bleeds did not close on shifting from LOW RPM to NORMAL (high). In this event, HP developed by the engine will be noticeably low. Flight crews should be alert to this situation. If T.I.T. is monitored during the shift, closing of the bleed valves can be checked by a decrease of 30-40° as the engines shift from the 10,000 to 13,000 plus RPM range.

TAKE-OFF-NOTES

54/ Take-off power is 971°C T.I.T. Due to manufacturing tolerances, there is a possible variation of ±6°C, so at 90° coordinator position, the T.I.T. may be between 965 and 977°C. If T.I.T. exceeds 977°C, reduce to 971° by retarding throttle, and note in Airplane Log. Regardless of T.I.T. reading, do not advance throttles beyond 4000 HP on Torquemeter. Engines may not be operated at temperature between 932 and 977° for more than 5 minutes.

ACTION REQUIRED FOR OVERTEMPS DURING POWER INCREASES:
If T.I.T. is in 977°-1050°C range exceeding 5 seconds, or if T.I.T. is in 1050°-1116°C range exceeding 2 seconds:

(1) On take-off or in flight, reduce T.I.T. to 895°C or below and record; slowly advance throttle (not to exceed 977°C), if limit is again exceeded, record and inspect at next landing;
(2) On the ground, reset throttle to flight idle, slowly advance throttle (not to exceed 977°C), if limit is again exceeded, shut down and record, call for maintenance inspection.

If T.I.T. exceeds 1116°C: In Flight, reduce power immediately to 895 or below; on the ground, shut down the engine immediately and call maintenance.

CAUTION: WITH AN ENGINE AT OR NEAR A ZERO THRUST CONDITION AND WITH THE AUTO-FEATHER CIRCUIT ARMED, AN EXTREMELY RAPID THROTTLE BURST TO TAKE-OFF CAN CAUSE AUTO-FEATHERING. THIS IS DUE TO THE COMPLETE ARMING OF THE AUTO-FEATHER SYSTEM (THROTTLE ABOVE 75°) BEFORE 500 POUNDS THRUST IS BUILT UP BY THE PROPELLER.

55/ CAUTION: IF THE TAKE-OFF IS ABORTED, ENGINE DECOUPLING MAY OCCUR IF THE THROTTLE IS MOVED BELOW FLIGHT IDLE ON THE GROUND AT SPEEDS OF 130 KNOTS OR MORE.

56/ Nose steering should not be necessary after about 50-60 Knots speed has been attained, as rudder forces are adequate to steer above this speed despite considerable offset thrust such as might be caused by failure of an outboard engine. Keep hand on nosewheel steering control, though not steering, till V_{mc} is reached.

57/ In order to maintain V_2 speed during initial climb-out, the Pilot should initiate rotation (about lateral axis) by a slight back pressure on the yoke about 5 knots below V_2.

58/ Wing flaps are to be retracted after landing gear fully retracted, but not below altitude of 50 feet, and not below 135 knots airspeed.

First power reduction (932° T.I.T., or less, so as not to exceed 3400 Indicated Shaft Horsepower) is to be made when flap retraction is completed, when safe altitude and airspeed have been attained.

Accelerate to enroute climb speed before reducing to climb power.

NORMAL OPERATING PROCEDURES

CAPTAIN	PILOT	ENGINEER
CLIMB		
59/ORDERS CLIMB POWER.		59/WHEN CAPTAIN ORDERS CLIMB POWER, REPEATS COMMAND AND SETS IT UP.
CALL FOR CLIMB CHECK LIST.		READS CLIMB CHECK LIST.
LANDING LTS....RETRACT & OFF	WING FLAPS.....UP	
	GEAR LEVER.....NEUTRAL	AUTO FEATHER.....OFF
		60/PROP SYNC.....#2 OR #3 SYNC. THEN PHASE
SEAT BELT-NO SMOK.....OFF		PRESS & TEMPS.....CKD.
61/ALTIMETERS.....RESET	ALTIMETERS.....RESET	
		PRESSURIZATION.....RESET
CRUISE		
62/CRUISE POWER.....SET		
		63/PRESS & TEMPS.....CKD.
DESCENT - IN RANGE		
64/IAS (V_{NO} MAX.)....RED NEEDLE		
		65/PRESSURIZATION.....AS REQD.
66/SEAT BELT.....ON		
67/ALTIMETERS.....SET	ALTIMETERS.....SET	
		68/MAIN FUEL VALVES.....ON
		CROSS FEEDS.....OFF
	69/BRAKE PRESS (NORMAL & EMERG.).....CKD.	

NORMAL OPERATING PROCEDURES

CLIMB - NOTES

59/ After flaps are fully retracted, all obstacles have been cleared, a desired minimum altitude has been reached, and a climb speed of 210 knots has been attained, reduce to climb power, which is 895° T.I.T., or less, so as not to exceed 3400 HP.

60/ Aeroproducts says the prop sync. control should be in SYNC. about 1 minute before putting it in PHASE.

61/ When reasonably sure that it will not be necessary to return and land, reset the No. 1 altimeters to the sea level altimeter setting.

CRUISE - NOTES

62/ After attaining Cruise Airspeed, Captain sets up Cruise Power if he desires, or orders it to be set. Cruise Power is 847°C T.I.T. or less so that HP will not exceed 3400 and Airspeed will not exceed 324 knots. Whichever figure, temperature, power or airspeed, is reached first is limiting. Above 12,000 feet Mach .615 will limit airspeed rather than the 324 knots figure.

63/

	RED. GEAR	POWER UNIT	COMPRESSOR
PRESS. (PSI).....	130-225	50-75	100
TEMP. (°C.).....	60-85, 100 for 5 Min.		60

DESCENT - IN RANGE -NOTES

64/ The speed V_{no} should not be deliberately exceeded, even during descents, because of the possibility of excessive gust loads resulting from unexpected gusts. The speed range between V_{no} and V_{ne} is to provide for inadvertent speed increases and should not be deliberately used in normal operation.

65/ Cabin should be descended at minimum rate (normally 300 ft/min) required to effect complete depressurization prior to landing.

Set BAR IN HG to the altimeter setting for airport where landing is to be made, and set CABIN ALTITUDE to the field elevation (altitude of the airport above sea level), and adjust the RATE control as required to maintain desired rate of descent of cabin.

66/ Seat belt sign is to be turned on sufficient length of time in advance of landing to allow flight attendants to distribute coats, and take care of other duties, before NO SMOKING sign is turned on, which is signal for everyone to remain seated.

67/ Set all three altimeters as explained in Section 3-8 of EAL Flight Operations Manual, in accordance with information received from ground station.

68/ Landings are to be made with each engine connected to its respective MAIN tank.

69/ Hydraulic pressure should be approximately 3000 PSI. Air brake pressure should be approximately 2000 PSI.

NORMAL OPERATING PROCEDURES

CAPTAIN	PILOT	ENGINEER
DESCENT - IN RANGE CTD		
	70/RADAR.....UP & OFF	
		71/LANDING WT.....CKD.
72/LANDING SPEED.....CKD.		
73/AIRFOIL, ENGINE & PROP ICE PANELS.....AS REQD.		
74/AUTO PILOT.....AS REQD.		
BEFORE LANDING - FINAL		
75/NO SMOK.....ON		
	WING FLAPS.....SET	
	76/GEAR DOWN.....3 GREEN, PRESS NORM	
77/ **AFTER LANDING**		
		78/OIL COOLERS.....OPEN
		PROP SYNC.....OFF