

Lube system

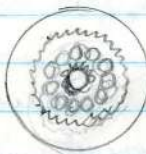
; fabrication, also for 2 cooling and 3 improved compression Seal.

Lead fouling extensive - 4.6ccs T.E. had P.C. in 115-145 grade fuel.

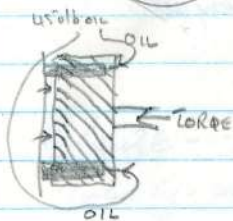
3. Magneto case section

Mount for 7 dual mags numbered as banks - clockwise from cooling fan end. Between mags 1 & 7, nose oil pr. take-off is installed. If 60-80 psi at this point, rest of engine is receiving enough oil. Used as pre-oil plug on new engine.

Between mags 6 & 7 - torque meter transmitter also, by planetary gears, 375:1 reduction ratio obtained.



C/S TORNS, SEMI FIXED STILL, ∴ PLANETARIES RUN AROUND, & THEIR CASE IS CONNECTED TO PROP SHAFT.



SEMI FIXED HAS HELICAL OUTSIDE CAN MOVE TO REAR UNDER INFLUENCE OF PROP TORQUE. THIS IS BALANCED BY OIL PRESSURE, AND ENG. HAS INDICATION OF THE OIL PR. NEEDED. ^{TO BALANCE TORQUE}

∴ HE KNOWS H.P. AT PROP @ ALL TIMES.

$$\text{BHP} = K \times \text{RPM} \times \text{Tq meter reading}$$

$$= 0.00430 \times ? \times ?$$

$$\text{BMEP} = C(780) \times \text{Tq meter reading}$$

Spark advance mechanism - ensures ^{peak} pressure 5° after top dead centre at all normal mixtures. Imperative to get max. use from power stroke. Engineer has control. Normal 20° before TDC, lean 35° before TDC.

Mags operate at .5 c/s speed.

4. Power, or crank case section

a Subdivided font - mag case - centre 'D' row
font intermediate centre 'D' - Centre 'C'
centre Centre 'C' - Centre 'B'
near intermediate Centre 'B' - Centre 'A'
near Centre 'A' - Power case.

Each subdiv. has cam plate, 1/6th c/s speed. 2 tracks on the plate, 3 lobes on cam track

4 scavenge pumps.

Cranksaft 1 piece, hollow, steel. 5 steel backed, leaded silver bearings lead liner is to absorb any particles & protect c/s.

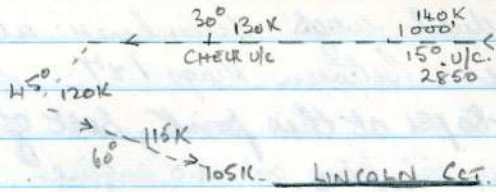
Aluminium alloy crank case. will absorb twisting moment of engine. Splash & spray oiling.

C/saft balanced statically & dynamically.

b Cylinders - barrel, muff, & cyl. head. Bore 5.75" Stroke 6"

Steel barrel, case hardened surface,

Piston has 3 comp, 2 oil control, 1 oil scraper ring.



pent to read - 3 → 4 → 2 - 2 Scavenge pumps.
 note c/case blowls - accessory sect.

Starter - 208V AC. direct cranking. Bendix. Clutch slips @ 1100 RPM.
 Blower. 1 motor to shaft #148:1 + shaft to C/S 3:1.

ADI System - Sole purpose - to suppress detonation.
 28 PSI.

Muff is aluminium alloy. Head forged al. alloy. Silicon rubber fin spaces to damp vibration. Platinum point plugs. 'Helicoil' spring between plug & plug socket in cylinder head.

Thermocouple fits in top of c. head (250°C max). D-6 cylinder 233°C max cruise.

9 gal H₂O tank cal. engine for water injection.
 Drop: AMC -100km. SAC 80. SAC (high dlt). 60 RPM.

Valves - 1100g, 2 eccentric springs impart twist tendency, +. helping dislodge lead.

- 2 springs :-
1. safety measure.
 2. better seating action.
 3. takes all valve bounce.

Exhaust - mushroom,
 - cold by - extra fins.
 Sodium
 valve overlap 40°
 wider X section.

Intake - tulip.

30000 cold setting

5 Blower section

Impeller 6.375 : 1 of c/s., through hydraulic spring loaded coupling, to protect gears - prevents sudden engine speed change being directly applied to the gears. Air speed from impeller - 100 mph.

Also a shearing point on the main shaft to avoid failure anywhere behind the blower from jamming the engine.

If heavy continuous oil smoke, check seals in blower bay. means engine change.

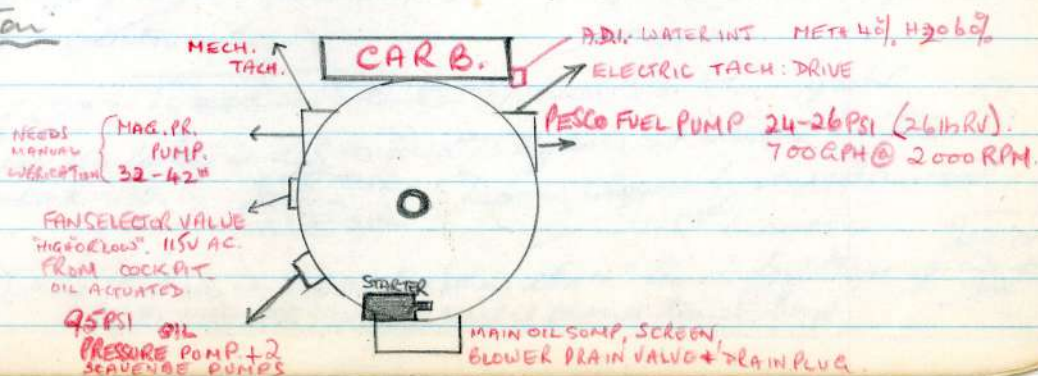
2 Scavenger pumps with de-aerating screens.

mounting points at this section. Also manifold for take-off, + fire detector bulb. (2000 RPM/15 min will clean out the 1/16 of inch burr which could be deposited in this area).

Fuel feed valve, slinger ring, + holes in impeller blades feed air the fuel.

6 Accessory Section

Weld @ 20 PSI to cut
 down leaks.



NEEDS MANUAL LUBRICATION
 MAG. PR. PUMP. 32-42"

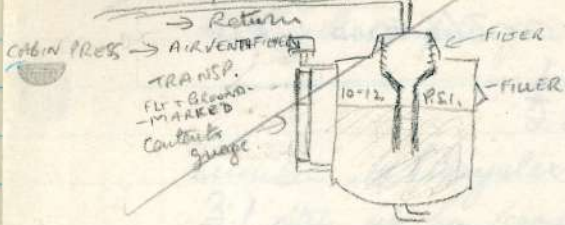
FAN SELECTOR VALVE
 HIGH/LOW. 115V AC.
 FROM COCKPIT
 OIL ACTUATED.

95 PSI OIL
 PRESSURE PUMP + 2
 SCAVENGE PUMPS

Main System (gear, steer, & bomb doors)

Reservoir, 6.7 gal., contains filter thru which return oil travels

fluid level drops 4 gal on 7.0 - 4 1/2 gals need 2 ea. to retract (gravity drop)



The 10-12 lb pressure intended to keep fluid de-aerated @ high & to ensure delivery @ pumps.

Pump motors - AE, 208V 3PH 4000C. 2 of them 16HP EA. gets very hot. Operational time limit. Only 2 mins of every 10 can be run at max. pressure. During gear retraction both run together. Draw 160 AMPS

a time delay (fuse) installed to prevent colossal drain if both started together. double phase leads, so ea motor has 6x60 amp fuses. No 1/2 fuses in Rt main A.C. power panel. No 1 is main, no 2 auxiliary. If 1 fails, 2 won't run.

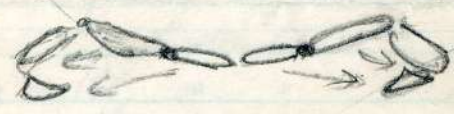
Hyd. pressure regulated by pump regulator in pump housing. @ 3150 PSI, cuts out. Also a relief valve in case pump regulator fails.

Pressure gauge on Engineers table - 95-100' from system main section. break anywhere in this line would cause loss of all pressure. main gauge "fuse" - contains piston & springs which breaks fluid line, but maintains the pressure from the fluid either side of it.

Selector valve - doors, gear & steer. contains solenoids energized by D.C. by switch (at same time pump is started) which direct pressure to correct line by attaching a piston.

Over-ride switch on Eng panel. by-passes all delays & selects pump in motion, meanwhile the piston in the solenoid can be manually pushed in.

Bomb doors (open in 1-2 sec) / actuator ca end. - at 6, & 8 bulkheads. Controlled from @ Nav's panel, Photo panel & Pilot's panel



3 position - open, close, neutral. Spring loaded to neutral. Indicator lights, 2

- 1. Red light on - doors fully open (2 switches)
- 2. Amber on - doors closed, switches in closed position.
- 3. No lights - doors closed, or in transit.

Bomb door switches will open, will not close doors

- 1. Photo Nav's panel
- 2. Photo panel
- 3. R.O.s table

(at 50' it stops (at 0' it operates))

Thermal re-circulation system according to temp of fluid in lines, it pushes the fluid around the system, friction prevents cold congealing of the fluid. Eng. has switch & breaker on his panel. Doors must be closed for this to operate, also will only come on if no other hyd. service being used. Door lines insulated.

Door operation

- 1. Normal. 2. manual op. of override procedure. 3. Emergency method. Rearcomp. LH.

11B head. Red hand pump & selector valve. 16" also extension. Normal 3 1/2" + 1/4". Type LP. 1100. on 10. at 12" extension, nose gear safety switch automatically cuts out steering system. Steered by toothed piston which acts - 50 PSI. Door closed by mechanical catch on gear. 45" travel.

On landing light (uncaden), nose strut can be deflated to within the 12" limit for steering. Clumper mounted on Rt H. wall of forward turret bay.

at 1100 cuts off again

Hydraulics. AN-O-366 FLUID. Red.

info: in T.O. 01-52UD-2

Four Services

- 1 Landing gear & doors. ^{50 sec up, 60 sec down, ON JACKS.}
- 2 nose wheel steering
- 3 Bomb bay doors.
- 4 Brakes.

Four Systems

- 1 Main Hydraulic System - operates ^{50 sec up, 60 sec down} gear, steering, & bomb doors.
- 2 Brake System.
- 3 Emergency system @ Can drop v/c @ Can charge brake accumulator.
- 4 Bomb door emergency system.

(Power section - reservoir, pump, & selector valve)

Locations

- 1 Main system power section - R.H. side of Bomb bay on centre wing section.
- 2 Brake system power section - on #7 bulkhead. External pump under T BH to maintain pr. when no elect. power on system to oil pumps.
- 3 Emergency system - Hand pump & selector valve R.H. side of R.O.s compartment.
Reservoir - in auxiliary crew members compartment. * 1 Ro.
- 4 Bomb door emergency system - #11 bulkhead, L.H. side fuselage.

Operation

By electrical circuits to pumps. D.C. from switch to relay. A.C. from them on to motor. Limit switches stop motors. No pressure in lines when system not operating - to minimize battle damage.

1 Fan case section

3 hyd. couplings -

1 low. } selected by fan selector switch. ~~1.1~~ 1.1
2 High. } 1.75

Similar to Chrysler fluid drive. 99% efficient.

3:1 step up fan/coaxial drive speed via planetary gear.

Pre-flight - on changing gear fan high to low, check for 12-15 PSI drop on torque meter

Low fan 0-13,500'

13,500 - 20,000' HIGH IF UNDER 2200 RPM.

20000 - EITHER FAN.

Fan brake. Engine feathered, no lube, fan would windmill.

Stopped by spring & oil pressure. Loss of p. allows spring to pull brake on. 300 clearance when off.

Carburetion Stromberg.

Upper throttle body, regulating unit, metering unit, lower throttle body and automatic mixture control.

3 positions in ^{auto} mixture control - I.C.P. manual A.R.

15% throttle travel - idle jet.

NORMAL over 15% " " - normal jet.

over 10% " " - enrichment jet & de-enrichment jet.

War emergency rating. 2400 RPM, 3250 BHP, 68". 15 minutes.

Magneto DHRN-2

Dual. fires 4 cyls,

A.C. current.

H.T. - 13000V.

Primary coil - high A, low V.

Secondary coil - " V, low A.

Platinum pts, do let gap, but don't open more than $\frac{1}{16}$ " on examination.

Booster coil to support mag until it can reach its ^{own} operating speed.
"Starter coil" is name given to booster coil.

J-47 - Nov-19 5,200 lb thrust @ 100%

Purpose - to increase load, i.o. performance, speed, & gas consumption.

4,500 lb each pod - identical to BH7 inboard pods.

2,500 lb engine weight.

At sea level, will use 14-17 gals-minute

at 40,000' " " 2-4 gals.

From front to rear -

1. Accessory Section.

E.D. a. - engine driven

fuel pump. 3-400 lbs at top speed. 4,950 RPM = 100%

lubrication & scavenge pump.

Fuel regulator - controls engine speed via fuel pressure
Rear scavenge pump (deeper in the engine).

non E.D. b. 208V Starter.

fuel system

± 11° of travel

stop cock. meters fuel for starting, 1 is positive shut-off.

H.p. fuel filter.

oil cooler - fuel runs around oil cooling tubes.

oil runs around honeycomb through which fuel passes.

manifold lines - large & small.

fuel nozzle.

flow divider - opened pressure in man lines ensure pressure feed.

drip valve - clears manifold line on stopping

fuel control valve.

c. electrical.

Ignition vibrator coil. - transformer.

Two spark plugs for starting.

d. oil

filters

jets - to direct flow.

Fuel flow

J47-11 - one plug in nos 2 & 7 chambers.

J47-19 - 3 & 7 chambers - 2 plugs ea, a 40,000V total of sparks, and a wider Xover tube.

If revs exceed 1070° - removed for overhaul.

2. Air guide section - feeds air into compressor - 3 tons/min @ 100%
Leads pass to acc. section via "islands" -
- i. electrical
 - ii. oil.
 - iii. fuel.
 - iv. mechanical linkages.

3. Compressor section.

- a. forward frame, contains - no. of bearings for main shaft
- acc. case mounting.
 - front oil sump.
 - air guides
 - air balance piston - air from comp. is led to front of No. 1 bearing to relieve forward pressure.

b. Compressor casing in two parts, with stator blades. 12 rows.

c. Rotor assembly, 12 stage.

Air is compressed approx 5 to 1.

4. Mid frame section
- a. ~~Mid frame~~ - centre of engine, & support point.
- i. supports no. 2 bearing - only ball race bearing - termed the thrust bearing.
 - ii. houses fuel nozzles.
 - iii. forms rear oil sump.
 - iv. air bleed taken off 3 places for press. & anti-icing.
 - v. Air dividers.
 - vi. 8 ports to combustion chamber.
 - vii. Firewall.

5. Turbine unit section a. Turbine unit section (burner section).

- i. 8 combustion chambers.
 - ii. flame tubes (inner combustion chambers).
 - iii. small interconnect tubes, 'cross-over tubes' to convey heat & flame from the two spark ignited tubes.
- b. iv. Transitional piece - venturi.
- c. v. Nozzle diaphragm - vanes turn gas 90° to hit turbine buckets at greater angle.
- d. vi. Turbine wheel & shaft.
- e. vii. After casing.
- f. viii. Air frame support - has 3 + 4 bearings.
- ix. Air frame support - has 3 + 4 bearings.
- x. Outer cone. Insulated.
- xi. Inner cone.

6. Exhaust cone.

Junction

1. Starter turns at 500 RPM, keeps going to aid pick up to 20% power.

Temp at front of compressor - about 60°F. on bearing - 450-500°F.

Temp in flame tube 20-2100°F design of flame tube forces flame to centre of tube. Pressure very high. 5-6'/sec in tube, 14-16000'/sec.

Temp at cone 12-1800°F.

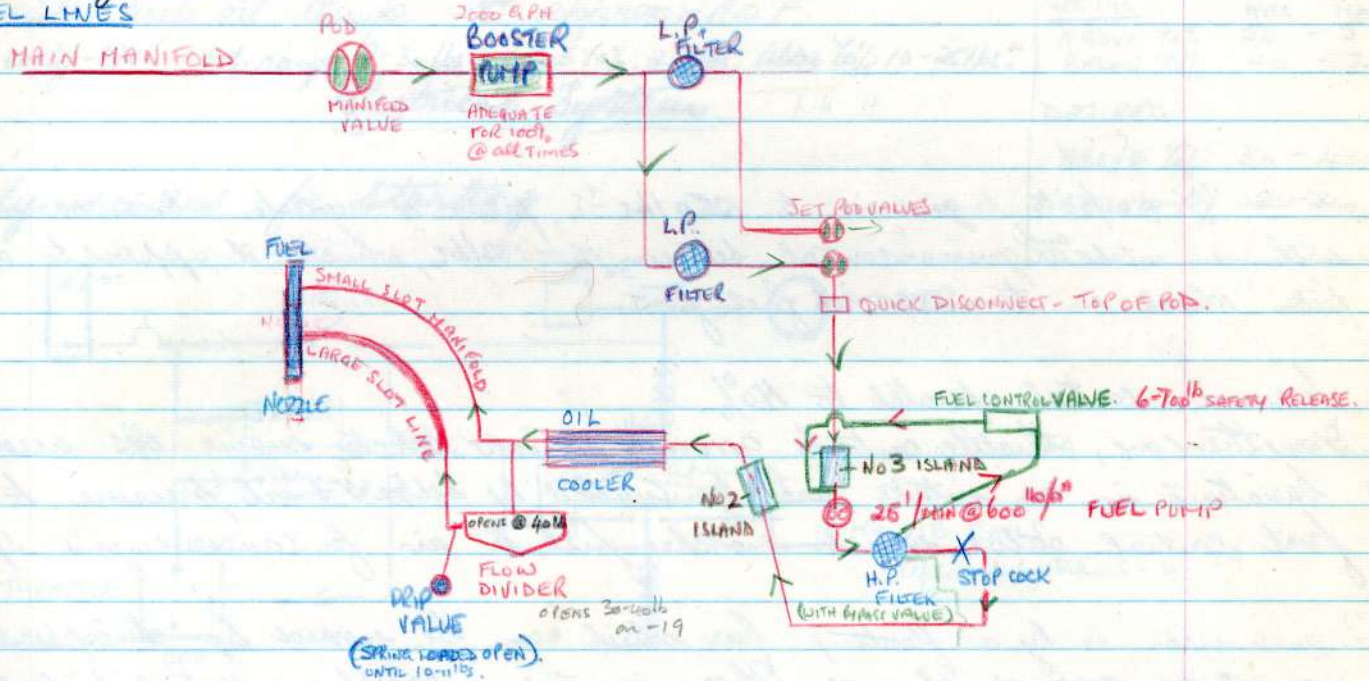
11th stage air to air balance piston.

8th stage air to turbine wheel bearing at front.

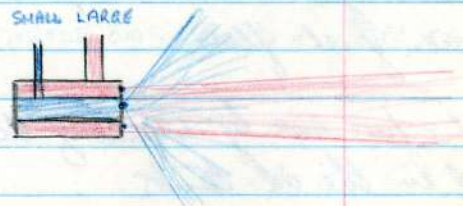
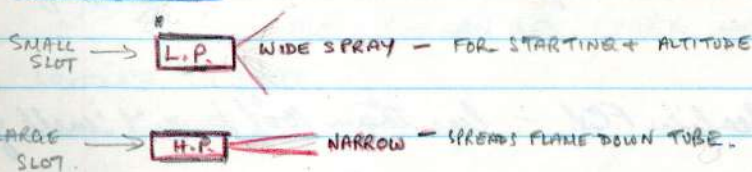
12th stage air " " " " " rear.

Fuel System

FUEL LINES



FUEL NOZZLE.



access: - air guide - comp - fuel - flame tube and sect - exhaust.

Oil System DRY SUMP.

Each engine has 20 gallon tank - 13 oil & air. OIL no 1005 grade
 1/2 Lubrication & Scavenge pump - lubes whole engine, scavenges
 Section clears front bearing, geartrain etc.
 This oil doesn't pass through cooler
 Engine uses 2 1/2 lbs oil/hour - anything above needs check.

2, 2, 3 & 4 bearing oil returned by rear Scavenge pumps, in mid-section.
 this is a double element pump - it can suck in from 2 locations.
 This oil passes through the cooler. A bypass valve is incorporated. ^{90°F all goes thru.} 60°F cut out.
 Tank is in wing.

Sump under ca. tank has oil shut-off valve, fused on pod power panels. Tank pressurised from aircraft system.
 2 3/4 lb, as other tanks.

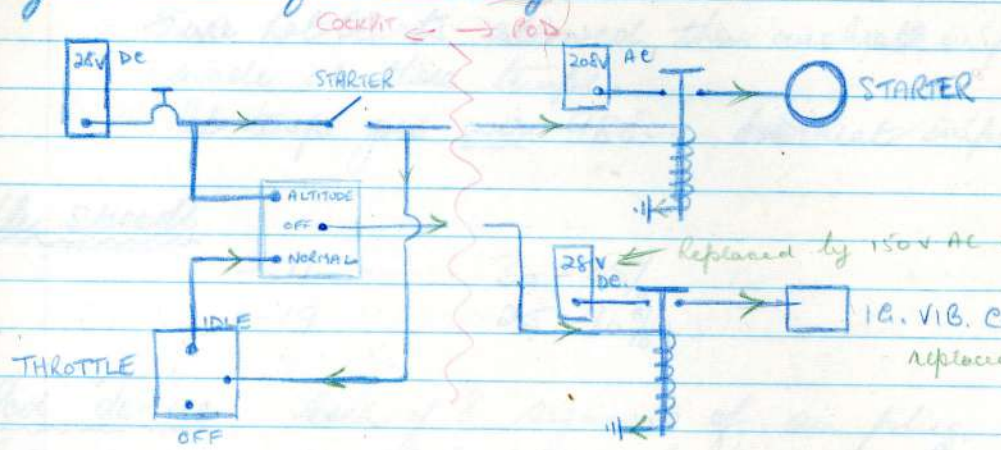
Oil temp Switch on panel. Turn out - at 40°F or below.
 above 15,000'.

It will keep oil temp. at approx: 40°F.

- 11, + early -19s, - oil range 2-30 lbs. below 10% 2-8 lbs. Above 10% 10-25 lbs.

Electrical System like 11

Only needed for starting



| late 19s. | MAX. | MIN. |
|------------|------|------|
| ABOVE 70% | 55 | - 5 |
| BELOW 70% | 40 | - 2 |
| DES. REQD. | | |
| ABOVE 70% | 30 | - 40 |
| BELOW 70% | 2 | - 40 |

WITH SWITCH TO NORMAL, STARTER "ON", + THROTTLE OPEN TO "IDLE" - SPARK CAN BE MADE
 "ALT" - CAN GET SPARK WITHOUT STARTER "ON". SWITCH IS SPRING-
 LOADED TO "OFF".

Unit desired to idle at 2-4% during flight - keeps lube going
 and prevents vibration damage.

Jet operation

Instruments -

1. Fuel pressure.
2. Oil pressure.
3. Tachometer.
4. Tail pipe temperature.

Four thermocouples in tail pipe give average T.P. temp.

upper limit 655°C

$670-90^{\circ}\text{C}$ 5 minute limit at T.O.

" " 30 " " in flight.

never use 100% 5 " " at T.O.

30 " " in flight.

over 104% - ups.

2. Hot Start -

cause by too large a fuel/air ratio - too much fuel press.
T.P. between $870-980^{\circ}\text{C}$ considered a hot start.

Five hot starts allowed, then overheat inspection must be made at these temps.

If temp. goes over 980°C - overheat inspection must be made.

3. Idle speeds

- 11 30-38%

- 19 25-30%

4. Pod de-ice each of 8 segments of air plug, each hinge, & hole in nose is electrically heated by "NOSE DE-ICE SWITCH".

Lead frame air is piped through valve "POD DE-ICE VALVE" to nose lip anti icing duct and in pod strut leading edge, bleeds overboard & warm fuel & oil lines.

"NOSE DE-ICE SWITCH" actuates "POD DE-ICE VALVE" 28VDC.
for internal heating -

"POD PRE HEAT SWITCH" - takes air from wing anti icing duct in L.F. by opening up 2 pod pre-heat valves, passes it around whole of compressor section to keep compressor warm & prevent coagulating of oil in cooler. Used to warm up pod before starting.

"POD PRE-HEAT SWITCH" OFF in case of fire.

5. Fire

- a. No extinguisher ram air shed.
- b. Fire detection systems installed.
- c. 10 thermo switches,

- ① 4 around exhaust case 700°F.
- ② 2 " mid frame 450°F.
- ③ 2 " air guide screen 450°F
- ④ 2 in air plug. 450°F.

4 warning lights - two switches for test.

IN CASE OF FIRE.

- Turn off pod pre heat valve
- Close throttle.
- Close oil valve.
- Close fuel valve.

STARTING PROCEDURE.

OIL VALVES 'ON' AT TIME WHEN AIRCRAFT AIRBORNE.

1. Throttle closed
2. Push in all ckt. breakers, or those of engines you wish to start.
3. Throttle override switch checked off.
4. Throttle control switches in "lever" position.
5. Check fire warning lights.
6. Oil switches "on" - red guards down.
7. Air plug switch "open" position
8. Ignition switch to "NORMAL".
9. Turn on pod manifold valve.
10. Turn on fuel switch to engine you wish to start.
11. Booster pump "on" + check that 2 tanks are out manifold.
12. Engage starter watch tach.
13. Push throttle forward, almost to idle
14. As T.P. temp rises pull back throttle to keep fuel pressure below 40 lbs. Keep starter button engaged.
15. Release starter switch off ignition
16. After minute or so, push up to idle.
17. Check 100%

at 6-7%
10

at 20%

If fails to start - if no rise in TP temp at 8-9%
Close throttle + check through -
1. If fuel probk - ignition trouble

STOPPING PROCEDURE.

1. Pull back to idle detent.
2. Keep air plugs open until T.P. below 100°C .
3. Turn off fuel valve after closing throttle.

AIR START.

1. Rod pre-heat, + use anti ice if over 20000'. Oil heat on over 15000'
2. Air plugs open as engine is selected for starting.
3. As for normal start, omit starter, but use "altitude" instead of "normal" on the ignition switch.

Easy throttle movements to avoid air lock in compressor.

HEADQUARTERS
5TH STRATEGIC RECONNAISSANCE WING, HEAVY
Office of the Standardization Board
Travis Air Force Base, California

EMERGENCY PROCEDURES EXAMINATION
A/C AND PILOTS

RB-36 AIRCRAFT

NAME FIELD, J.H. RANK FLT DATE 11 APRIL 52
SQUADRON 31 CREW POS. _____ CREW No. A-1 SCORE 100%

1. Locate the exits from all crew compartments.

a. Bail-out:

Front L + R escape hatches, nose wheel wells
Photo. entrance hatch, left escape hatch, bomb bay.
Rear L + R lower blisters escape hatches (blisters)
+ entrance hatch.

b. Ditching or crash landing:

Front L + R windows, astrodome, L + R Escape hatches
Photo L escape hatch, Fwd Gun. Bay.
Rear Upper blisters. - (all that are usable)

2. What four ways can landing gear be extended?

a. NORMAL

b. OVERRIDE.

(put plunger in before putting switch on)

c. EM. HAND PUMP.

d. MANUAL.

3. How can the flaps be lowered in an emergency?

MANUAL SCOTCH SELECTION IN Bomb bay.

4. What is the cause of the horn blowing:

a. Steady before take-off? Flaps not between 167 24°

b. Steady in the air? Gear up, throttle below normal cruise.

c. Intermittantly? NONE.

5. Is there a Manual emergency operation of the bomb bay doors? If so, explain.

Left side bulkhead # 11, Sel. valve & hand pump

6. In what way can the cabin pressure be released in forward and rear compartment?

SLOW DUMP VALVE

VAC. REL.

Engineers dump valve.

(Also can lose off press.) (2)

7. Give procedure to be followed in case of fire:

a. Engine fire tell crew, feather, cut off pressurization from outside, fuel off, fire bottle(s). air plugs & intercoms as they are.

b. Cabin fire while pressurized

NOTIFY crew, camp on oxygen, depressurize, fight fire. NO NO ETC ON EJECT. FIRE.

c. Wing fire As engine fire

8. How many portable oxygen bottles are provided?

3 F. 2 P. 2 R.

9. How can pilot tell when his tires are skidding?

SCANNERS.

10. With a fully charged system and brake pump off, how many brake applications may be made?

3.

11. In event of normal interphone failure, what means has the pilot of communicating with crew?

AVT i/c.

12. Should all hatches be opened before an emergency landing?

YES

()

13. Where are the ditching jackets stowed?

NOT.

14. Where is the location of the life rafts?

1 weapons, 1 photo 1 read.

15. Is it possible for the gunners to open No. 4 bomb bay door for bailing out?

No

16. Where are the engine fire extinguisher bottles located?

2 each wheel well.

17. How can the maximum air flow be directed against the desired windows for defrosting?

Fuel heat, boost fan, portable heaters or selector as desired

18. After touchdown on landing the flight controls are locked before 50 M.P.H.

19. At what nose wheel oleo extension is nose steering inoperative?

12"

20. Is it possible to lower single sets (pairs) of flaps? If so, how?

pull out breaker on flaps not reqd.

21. If one flap jackscrew breaks will the corresponding flap on opposite side lower? Why?

No, 30 limit switch.

1 flap 1° out - ahead one to low speed until slower catches.

1 flap 2° out - front one stops. Both flaps stop at 3° difference.

22. If one flap is damaged in the air, rendering that pair inoperative, can the pilot operate the remaining two pair? How?

Yes, pull out breaker on damaged flap, + select normally.

23. Can the flight controls be manually over controlled in the locked position?

Yes, slowly.

24. What should be done in event of a failure of a pressure regulator?

turn regulator off

25. Below what altitude would you avoid pressure breathing?

35,500'

26. At 25,000' with a 20 man crew your oxygen supply will last approximately 7 hours.

27. When the E-6 Auto Pilot on-off switch is in the "on" position and the Auto Pilot is not engaged, will the automatic recovery operate?

Yes.

HEADQUARTERS
5TH STRATEGIC RECONNAISSANCE WING, HEAVY
Office of the Standardization Board
Travis Air Force Base, California

RB-36 FAMILIARIZATION QUESTIONNAIRE
A/C AND PILOTS

NAME Field RANK P/A DATE _____
SQUADRON 31 MOS C/P CREW No. A1 SCORE _____

USE ANSWER SHEET PROVIDED. DO NOT PLACE ANY MARKS IN THIS EXAMINATION

AIRPLANE GENERAL

1. The Technical Order number for the RB-36 Handbook of Flight Operating Instructions is:
 - a. 01-5EUB-1
 - b. 01-5EUC-1
 - c. 01-5EUD-1
 - d. 01-5EUA-1
2. The Technical Order number for the RB-36 Handbook of Erection and Maintenance Instructions is:
 - a. 01-5EUB-3
 - b. 01-5EUC-2
 - c. 01-5EUC-1
 - d. 01-5EUD-2
3. The B-36-A airplanes which have been modified and reconverted at the Consolidated-Vultee factory are known as:
 - a. RB-36 E's
 - b. B-36 D's
 - c. B-36 C's
 - d. RB-36 D's
4. What is the grade number and the color of the alternate grade of fuel used with the R-4360-41 engine?
 - a. 115/145; purple.
 - b. 100/145; green.
 - c. 100/130; purple.
 - d. 100/130; green.
5. In flight, with the reciprocating and the jet engines in operation, the fuel configuration for each wing should be as follows:
 - a. All tank valves open and all boost pumps on.
 - b. One tank valve open and one boost pump on.
 - c. Two tank valves open and two boost pumps on.
 - d. Three tank valves open and three boost pumps on.