2AF MANUAL 50-27 (Revised)

SECOND AIR FORCE

WOHLMUTH

B-29 STANDARD PROCEDURES FOR PILOTS

1 JAN 1945

R-E-S-T-R-I-C-T-E-D

HEADQUARTERS SECOND AIR FORCE

Colorado Springs, Colorado

1 January 1945

B-29

STANDARD PROCEDURES

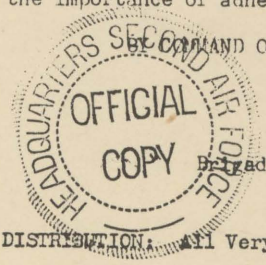
FOR PILOTS

These check lists and procedures supersede 2AF Manual 50-27, "B-29 Standard Procedures for Pilots", dated 25 July 1944. The changes included in this revision are dictated by changes in airplane design and by improvements in operating procedure demonstrated in actual flight tests.

Criticism is encouraged and should be directed to the Commanding General, Second Air Force. Any changes in procedure must be approved by this headquarters before being used.

The following letter from General ARNOLD emphasizes the importance of adhering strictly to these procedures.

BY COMMAND OF MAJOR GENERAL WILLIAMS:



ALBERT F. HEGENBERGER,
Brigadier General, United States Army,
Chief of Staff.

DISTRIBUTION: All Very Heavy Bases.

R-E-S-T-R-I-C-T-E-D

ADDRESS REPLY TO
HEADQUARTERS OF THE ARMY AIR FORCES
WAR DEPARTMENT
WASHINGTON, D. C.

WAR DEPARTMENT
HEADQUARTERS OF THE ARMY AIR FORCES
WASHINGTON

15 JUL 1944

Major General U. G. Ent
Commanding General
Second Air Force
Colorado Springs, Colorado

Dear Ent:

I have just been advised that you have issued detailed operating procedures for flying the B-29 airplane and have established standardization boards at all your B-29 bases and your headquarters for closely checking observance of these procedures and for keeping them up to date. I am further advised that you intend taking immediate action on cases of careless or wilful violation of these procedures.

The purpose of this letter is to let you know that I feel your action to be entirely commendable and that I desire you to instruct your supervisory personnel that the procedures you have laid down be made very clear to crews operating B-29 equipment, together with the fact that strict observance of those procedures is mandatory for all concerned.

An airplane of the size and cost of the B-29, and possessing as it does such tremendous possibilities for influencing the course of the war, must and shall be operated properly and I am looking to you to see that, in the training of B-29 crews, this is done.

Sincerely,

H. H. Arnold

H. H. ARNOLD
General U. S. Army
Commanding General, Army Air Forces

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SECOND AIR FORCE
OFFICIAL PILOT'S CHECK LIST
B-29

Before Starting Engines:

1.	Visual Inspection	Completed
2.	Form 1A, Loading List, Weight & CG	Checked
3.	Crew Inspection	Completed
4.	Parachute	OK OK
5.	Clothing	OK OK
6.	Life Preserver	OK OK
7.	Parking Brakes and Chocks	Set Set
8.	Emergency Landing Gear Door Release	In Place
9.	Emergency Bomb Bay Door Release	In Place
10.	Emergency Cabin Pressure Release	In Place
11.	Landing Gear Transfer Switch	Normal
12.	Overcontrol	Engaged
13.	Landing Gear Switch and Fuse	Down - Fuse Checked
14.	Battery Switch	On
15.	Put-put	Started
16.	Hydraulic Pressure a. Main b. Emergency	OK OK
17.	Flight Controls	Checked
18.	Radios	Checked Checked
19.	Altimeters	Set Set
20.	Turrets	Stowed
21.	Seats and Pedals	OK OK
22.	Lights	Checked Checked
23.	Oxygen	OK OK
24.	Propellers	Hi RPM
25.	Turbos	Off
26.	Engineer's Report	Check List Complete Ready to Start Engines
27.	Stand Clear-Fire Guard	Clear Left, Clear Right

Before Taxiing:

1.	Vacuum	OK OK

2.	Gyros		Uncaged Uncaged
3.	Instruments		Checked Checked
4.	Alarm Bell	one	OK
5.	Phone Call Signal Light	con-	OK
6.	Combat Station Inspection	tact	OK
7.	Chocks		Out Left, Out Right
8.	Parking Brakes		Off, Stand by to Taxi

Before Take-Off:

1.	Bomb Bay Doors	Closed
2.	Emergency Brakes	Checked
3.	Airplane Headed into the Wind	
4.	Nose Wheel	Straight
5.	Engine Run-up	Stand by for Engine Run-up
6.	Wing Flaps	25 Degrees
7.	Trim Tabs	Set
8.	Auto Pilot	Off
9.	Windows and Hatches	Closed Closed
10.	Turbos	No. 8
11.	Propellers	Hi RPM
12.	Crew	Prepare for Take-off
13.	Radio Call	Completed
14.	Throttle Brake	OK, Stand by for Take-off

Before Landing:

1.	Notify Crew	Prepare for Landing
2.	Radio Call	Completed
3.	Altimeters	Set Set
4.	Trailing Antenna	In
5.	Auto Pilot	Off
6.	Turrets	Stowed
7.	Hydraulic Pressure a. Main b. Emergency	OK OK
8.	Put-put	On the Line
9.	Propellers	2400 RPM
10.	Landing Gear	Down and Lights On
11.	Engineer's Report	Check List Complete: Weight____ CG_____
12.	Stall Speed	_____MPH

13.	Wing Flaps	Standing By
14.	Turbos	No. 8

After Landing:

1.	Hydraulic Pressure	OK
2.	Turbos	Off
3.	Propellers	Hi RPM
4.	Wing Flaps	Up
5.	Bomb Bay Doors	Open
6.	Parking Brakes	Set
7.	Magnetos	Checked
8.	Engines	Cut
9.	Radios	Off Off
10.	Controls	Locked
11.	Wheel Chocks	Chocks in Place Chocks in Place Brakes Off
12.	Form 1 and 1A	Accomplished
13.	Crew Inspection	

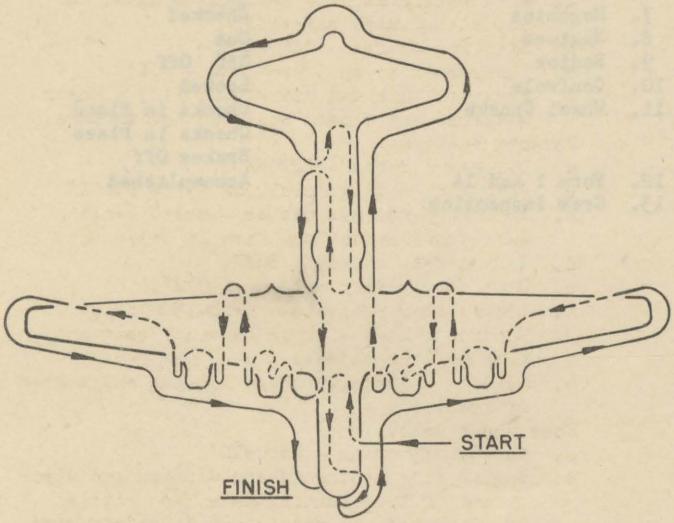
(2AF Manual 50-27
Rev 5 June 45)

SECOND AIR FORCE
AMPLIFIED PILOT'S CHECK LIST
B-29

BEFORE STARTING ENGINES

I. Visual Inspection Completed.

The diagram below designates the recommended procedure for preflight inspection. Arrows indicate direction of walk. DO NOT WALK THROUGH THE PROPS AT ANY TIME.



A. A visual inspection by the Airplane Commander and Pilot will include the following:

1. Place parachutes and personal equipment on ramp to left of nose section. This will prevent confusion when Airplane Commander calls for crew inspection.

2. Master, battery and magneto switches "OFF". Airplane Commander enters forward pressurized compartment and checks master, battery and magneto switches off. He then informs the crew permitting them to check for liquid locks.

3. Test for liquid lock. When the Airplane Commander informs the crew that the switches are "off", each prop will be pulled through four blades to test for

liquid lock. Do not pull blades in reverse in an attempt to break a lock. This is merely a preliminary inspection and does not replace procedure of pulling props through 12 blades before starting.

4. Form 1A and loading list. Check the Form 1A and sign (if necessary) the exceptional release. Fill out and sign the loading list.

5. Internal inspection of forward pressurized compartment. Check general condition and proper stowage of all equipment.

   a. Fire extinguisher - securely mounted and actuating valve safetied.
   b. Ditching braces - "STOWED".
   c. Compressor circuit breakers - "ON".
   d. Pressure bulkhead door (Sta. 218) - check movement and closed position for warpage.

6. Forward bomb bay.

   a. Ditching braces - "STOWED".
   b. Bomb door safety down lock - "IN PLACE".
   c. Emergency release cables - check tension, wear and freedom from foreign objects.
   d. Tank safety switch - "ON".
   e. Bomb door safety valves - "OFF".
   f. Accumulator pressure - 1200-1500 PSI.
   g. Control cables - check tension, wear and freedom from objects.
   h. Loading - visually check loading and number of bombs.

7. Nose wheel well.

   a. Nose wheel crank - "STOWED".
   b. Engine fire extinguishers - check red disc at end of line running down each bottle. If discs are not present or if safety wire is broken or missing, new CO_2 cylinders should be installed before flight. Should be safetied with fine brass wire. If the wire is too heavy, engineer will be unable to pull the handle.
   c. Nose well light - bulb OK and securely socketed. Check operation if anticipating night flight.
   d. Nose wheel solenoid shield securely mounted.
   e. Cannon plug - all cannon plugs should be tight and taped as an added precaution. If the rotating collar is not screwed tightly, engine vibration can shake loose the

cannon plug connections.

f. Nose wheel well doors and hinges - check for: condition and security of attachment of doors, latch spring on actuating mechanism for tension or distortion, and control cables for tension, wear and freedom of movement.

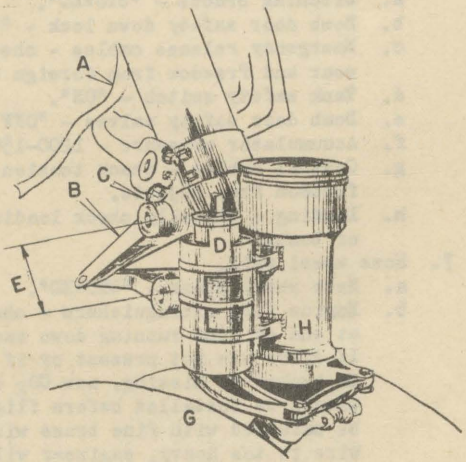
g. Nose gear limit switches - access doors to limit switches tight and screws lock wired.

h. Electrical or manual emergency system. Check cables for tension, wear and freedom of objects.

i. External power plug in box - socket clean and box secure.

j. Nose wheel inspection window - cleanliness and condition.

8. Nose Wheel.



a. Down lock - "IN PLACE".

b. Torsion links - alignment of pins and signs of failure.

c. Micro-safety switch - check for damage.

d. Shimmy dampener - check oil level. The top of the pin should be even with the groove (± 3/16 in.).

e. Strut inflation - 10" between pin centers (tolerance is + 1/2 and -1"). Check for

dirt on oleo and for leaks at filler valves and main packing nut.

f. Wheels - inspect for: mud, grass, ice, etc., distorted rim flanges and ribs, security and presence of nuts, bolts and cotter pins.

g. Tires - check for: proper and even inflation, excessive oil or grease, cuts, blisters, slippage, pulling away from rim, and chafing.

h. Centering device - security of mount.

9. Nose section.

a. Green house - check cleanliness and condition.

b. Pitot tubes - covers off and tubes open.

c. A.P.I. vent - "OPEN".

d. Schwein regulator vent - "OPEN".

e. Static sources - "OPEN".

f. Forward turrets - stowed; domes and gun enclosures on and locked and access doors closed.

g. Fuel tank vents - "OPEN".

10. Leading edge of wing between fuselage and No. 2 nacelle - inspect for cracks, corrosion, wrinkles and loose or missing rivets.

a. Aftercooler vent - "OPEN".

11. Front of No. 2 engine nacelle.

a. Prop blades - check for nicks, cracks and bends.

b. Thrust bearing and prop dome - check general condition.

c. Prop governor - check for evidence of oil leaks.

d. Cylinders - check for damaged or broken fins.

e. Bonding - check connections.

f. Spark plug leads - check all visible leads for condition.

g. Nose cowling - check: rigidity, loose rivets or DZUS fasteners, and dents which may hamper the airflow.

12. Leading edge of wing between No. 1 and No. 2 engine nacelle - inspect for cracks, corrosion, wrinkles and loose or missing rivets.

13. Front of No. 1 engine nacelle. Same as No. 11.

14. Leading edge of outboard wing. Same as No. 12.

15. Left wing tip - check for dents, cracks and loose or missing rivets.

a. Left navigation light - general condition (check operation if anticipating night flight).

b. Static discharge wicks - normally 3 on a wing tip.

16. Left outer wing panel - check for: wrinkles, holes, dents, loose or missing rivets, seams for gas leaks, inspection plates for loose fasteners.

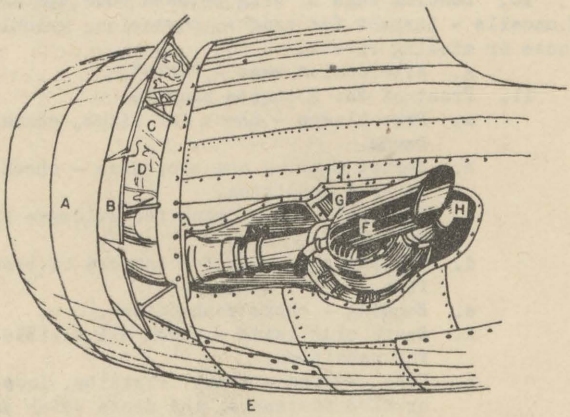
a. Aileron - check for holes, wrinkles, cracks and loose or missing rivets.

b. Trim tab - check condition and position of trim tab and recheck trim tab indicator.

c. Hinge pin retainers - check for presence.

d. Landing light - check cleanliness and condition. If anticipating night flight, check operation.

17. No. 1 nacelle (left side) - check for excessive oil or grease which is a definite fire hazard.



a. Cowling - check for dents, loose rivets and security of mounting.

b. Cowl flaps - check for cracks, dents, and security. Inspect all flexible shafts for kinks and chafing.

c. Bonding, spark plug leads, and cooling fins.

Check condition and security.

d. Intake stacks - check rigidity and signs for failure.

e. Fuel booster pump drain - "OPEN".

f. Exhaust stacks and turbo flight hood - check for broken lugs, studs, and bolts, cracked connections, and rigidity. Check exhaust expansion collar.

g. Top turbo head deflector in top of turbo well. Check for signs of failure.

h. Position of waste gate - "OPEN".

i. Oil cooler shutter - "OPEN".

18. No. 1 nacelle (right side).

a. Waste gate - "OPEN".

b. Top turbo head deflector - same as 17g.

c. Intake stacks - same as 17d.

d. Exhaust stacks and turbo flight hood - same as 17f.

e. Cowl flaps - same as 17b.

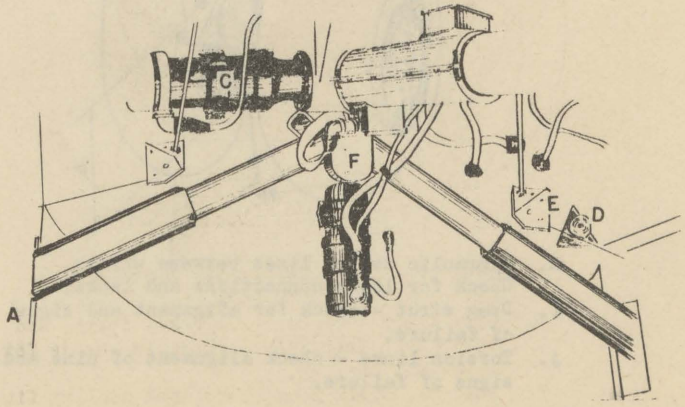
f. Cowling - same as 17a.

19. Left inboard wing panel - check for: wrinkles, holes, dents and loose or missing rivets, inspection plates for loose fasteners, and seams for gas leaks.

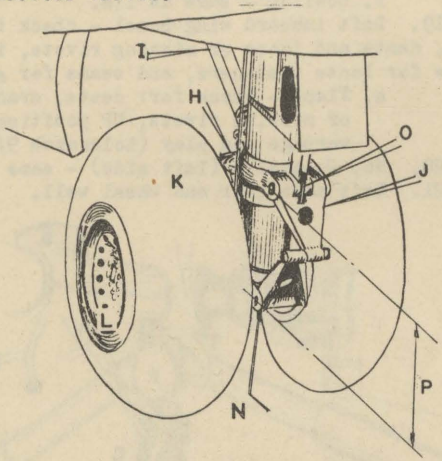
a. Flaps - check for: dents, cracks, and loose or missing rivets, UP position for alignment, warpage and play (tolerance 9/10" up).

20. No. 2 nacelle (left side) - same as No. 17.

21. Left main gear and wheel well.



a. Left well door - check: condition and security of attachment, control cables for freedom of movement, tension and wear, and latch spring on actuating mechanism for tension or distortion.
b. Down lock - in place.
c. Gear motors (emergency and normal). Check cannon plugs for looseness and taping. Check connections, security of mounting and general condition of motors.
d. Well light - check bulb for condition and tightness. If anticipating night flight, check operation.
e. Emergency door releases - check for tension, wear and freedom of movement.
f. Relay switch - security of mounting.
g. Fluid leaks in upper aft of nacelle - check fuel and hydraulic lines for leaks and chafing. This includes a check of the de-booster valves.



h. Hydraulic swivel lines between wheels. Check for loose connections and leaks.
i. Drag strut - check for alignment and signs of failure.
j. Torsion links - check alignment of pins and signs of failure.

k. Left wheel, tire and chock - check wheel for freedom from mud, grass, ice, etc., distorted rim flanges and ribs, security and presence of nuts, bolts and cotter pins. Check tire for proper and even inflation, excessive oil or grease, cuts, blisters, slippage and pulling away from rims.

l. Outboard and inboard brakes - check the bottom of the wheel for signs of leaks in the expander tubes.

m. Main gear scissors - check for alignment and signs of failure.

n. Ground wire - securely attached and grounded.

o. Micro-safety switch - check for damage.

p. Strut inflation - 13 1/4" between pin centers (tolerance + 1/2" and -1").

q. Right tire and wheel - same as 21k.

r. Outboard and inboard brakes - same as 21L.

s. Right well door - same as 21a.

22. No. 2 engine nacelle (right side). Same as No. 18.

23. Absolute altimeter antenna - check condition and security of mounting.

24. Left wing surfaces - check for loose rivets, inspection plates, cracks, wrinkles, and signs of excessive oil leaks from the engines.

25. Left blister - check for cleanliness and condition.

26. Upper turret - same as 9f.

27. Camera doors - "IN PLACE".

28. Auxiliary power plant exhaust - "OPEN".

29. Lower rear turret - same as 9f.

30. Marker beacon antenna - check condition and security of mount.

31. Tailskid - check for leaks on strut and signs of failure.

32. Left horizontal stabilizer and elevator - inspect for corrosion, wrinkles, cracks, dents, and loose or missing rivets.

a. Static discharge wicks - check presence of 2 on each stabilizer and 3 on rudder.

b. Trim tab - check condition and position and recheck position later with indicator in the cockpit.

c. Hinge pin retainers - check presence.

33. Tail turret - guns stowed and access covers on.

34. Condition of lights - check condition of all lights visible. If anticipating night flight, check operation.

35. Vertical stabilizer and rudder - inspect for corrosion, wrinkles, cracks, dents, and loose or missing rivets.

a. Trim tab - check condition and position and recheck position later with indicator in cockpit.

36. Right horizontal stabilizer - same as 32.

37. Command and liaison antenna - check security of support, corrosion, and condition of leads.

38. Interior of rear unpressurized compartment. Check for proper stowage of equipment, loose rags and general condition.

a. Starter crank - "STOWED".
b. Fire extinguisher - same as 5a.
c. APU and battery - examine exterior for loose parts, leaks, and loose electrical connections. Check the oil level with the gage. (Should be up to "F" mark.) Check fuel.
d. Rope for starting APU.
e. Control cables - check for tension, wear, and freedom from foreign objects.

39. Rear pressurized compartment.

a. Emergency cabin pressure relief valve. Check seating and security.
b. Vacuum relief valve. Check for positive seal and freedom of movement.
c. Pressure bulkhead door (Sta. 834) - Check for movement and closed position for warpage.
d. Fire extinguisher - same as 5a.
e. Aldis lamp - OK.
f. Electric salvo switch - circuit breakers "ON".
g. VHF and IFF switches - "ON".
h. Pressure regulators - check general condition and rigidity of both regulators. Knurled knobs should be screwed down tightly.
i. Emergency cabin pressure release - check seating security and general condition of latching mechanism.
j. Manual salvo "T" handle - in place with

guard down.

k. Pressure bulkhead door (Sta. 646) - check movement and closed position for warpage.

l. Ditching braces - "STOWED".

m. CFC dome - cleanliness and condition.

40. Rear Bomb Bay.

a. Bomb door safety down lock - "IN PLACE".

b. Bomb bay tank safety switch - "ON".

c. Emergency main gear hand cranks - "STOWED".

d. Emergency landing gear "T" handle - in place. Hand crank gear boxes - sockets free from dirt and foreign bodies.

e. Portable motor - condition and security.

f. Bomb door safety valves - "OFF".

g. Accumulator pressure - 1200-1500 lbs.

h. Loading - visually check loading and number of bombs.

i. Control cables - check for tension, wear and freedom from foreign objects.

41. Right blister - cleanliness and condition.

42. Right wing surfaces - same as No. 24.

43. Rear bomb bay tank vent - "OPEN".

44. Rear bomb bay doors and salvo releases, check for dents and warpage. Check cables for tension, wear and freedom of movement.

45. Rear bomb bay compressor air intake and exhaust- "OPEN".

46. Mid-wing section.

a. Radar dome - retracted.
Eagle wing - check for dents, cracks, wrinkles and loose or missing rivets.

b. Midwing tank - check gas load (gage) and filler cap in place.

c. Gas lines for leaks, loose connections, and chafing.

d. Transfer pumps for leaks, rigidity and general condition.

e. C-1 test connection.

47. Front bomb bay doors and salvo release. Same as 44.

The preflight from this point progresses as shown in the diagram on page 1. Consult the method of inspection of the various parts of the left side of the airplane for reference in inspecting similar parts of the right side.

II. Weight and CG checked. Flight Engineer will hand the Airplane Commander for approval and signature the weight and balance sheet (Form F). Airplane Commander will see that CG is between limits (minimum between 18% and 24%, maximum at 34%).

III. Crew Inspection Completed.

Airplane Commander will enter the airplane, see that all ignition switches are turned off and signal the other crew members or the ground crew to pull the props through, provided the engines have been cut more than 30 minutes. Props should be pulled through at least 12 blades, with not more than 2 men to a blade. If prop seems to stick, remove plugs from bottom cylinders, pull the prop through to remove excess oil from the cylinders, install clean plugs and pull the prop through 12 blades. (Do not attempt to relieve a liquid lock by applying pressure or by pulling the prop backwards.) Airplane Commander will then have crew line up to the left of the airplane's nose in the following order: Pilot, Bombardier, Navigator, Flight Engineer, Radar Operator, Radio Operator, Gunners and Passengers. Crew will then be inspected for physical condition and equipment, including oxygen masks, parachutes, flying clothing, and identification tags. (If dirty ramp conditions exist, crew members may place parachutes and other flying equipment in the airplane during preflight. However, parachutes will be worn and all other flying equipment will be carried at crew inspection. It is definitely the airplane commander's responsibility to inspect the crew and all their equipment before flight.) Airplane Commander will see that each crew member is familiar with his duties and with emergency procedures. After completing this inspection, crew members will enter airplane and begin check lists for their stations.

NOTE: Prompt discovery of a liquid lock may prevent a late take-off. The first crew members to reach the airplane will (after throwing all ignition and battery switches off) pull each prop through four blades. This is merely a preliminary inspection and does not replace the procedure explained above. Each prop will be pulled through 12 blades immediately before crew inspection.

IV. Parachute OK.

V. Clothing OK.

Airplane Commander and Pilot check their clothing and the operation of their electric suits. Also

adjust helmet, throat microphone, and attach oxygen mask to left side of helmet.

VI. Life Preserver OK.

On all overwater flights, Airplane Commander and Pilot check to see if their life vests are fitted with cartridges. Wear parachute harness over life vest.

VII. Parking Brakes and Chocks Set.

VIII. Emergency Landing Gear Door Release in Place.

Airplane Commander sees that release handle is in its proper position. Pulling this handle releases the nacelle doors only.

IX. Emergency Bomb Bay Door Release in Place.

T-Handle on Airplane Commander's control stand.

X. Emergency Cabin Pressure release in Place.

T-Handle on Airplane Commander's control stand.

XI. Landing Gear Transfer Switch Normal.

Airplane Commander sees that switch (Airplane Commander's Control stand) is in the "Normal" position. In this position the main landing gear and nose wheel are operated by the Landing Gear Switch on the aisle stand. When landing gear transfer switch is in the "Emergency" position, power from the engine driven generators is directed to the emergency bus and the emergency landing gear motors can be actuated by the emergency landing gear switches (see Emergency Procedures).

XII. Overcontrol Engaged.

Airplane Commander sees that the lever (on Airplane Commander's control stand, but eliminated in later models) is in the engaged position (FULL FORWARD). This engages the Flight Engineer's throttles.

XIII. Landing Gear Switch Down and Fuse Checked.

Switch (Airplane Commander's aisle stand) should be down. Check to see that fuse in the aisle stand is in place and not burned out. NOTE: Landing gear switch will be in down position for landing and all ground operations.

XIV. Battery Switch On.

Flight Engineer flips battery switch ON and notifies the Airplane Commander. All electrical circuits can be energized by either the battery or the auxiliary power unit, or both. Both are used for normal ground operation on loads up to 200 amperes. For additional power, use an external power source or engine driven generators.

XV. Put-put started.

Pilot tells Tail Gunner to start the put-put.

XVI. Hydraulic Pressure OK.

The Pilot asks the Flight Engineer to check the emergency hydraulic pressure on Engineer's panel (800-1000 lbs) and checks the hydraulic pressure gage on his own instrument panel for a pressure of between 800 and 1000 lbs. A fluctuating needle indicates a faulty pressure regulator. If the hydraulic pump should overheat and smoke, remove the fuse on the Engineer's aft fuse panel. To prevent overheating, see that pump stops when pressure reaches 1000 PSI.

WARNING: If an expander tube is broken while taxiing, use emergency brakes only. Use of both normal brake pedals at the same time would provide no braking on either side and would allow all fluid and pressure in the normal system to drain through the broken tube. Use of both emergency brakes at the same time will provide 100% braking on the good side (left gear, for example) and 50% braking on the bad side (right gear, for example). And by switching the emergency system filler valve (Engineer's panel) to open, pressure and fluid can be maintained indefinitely in both the normal and emergency systems. In those cases where all fluid and pressure in the normal system is lost, check valves prevent loss of fluid in the emergency lines, regardless of position of emergency system filler valve, and these lines hold enough fluid for approximately three applications of the emergency brakes.

XVII. Flight Controls Checked.

Airplane Commander pushes down locking lever located at forward end of Airplane Commander's aisle stand. This also unlocks the throttles which are held in the closed position by a lock bar when the control lock is on. This lock bar is linked to the control lock in such a way that strong forward pressure on the throttles will force the control lock off and eliminate the possibility of locked controls on take-off. The control check is made by the Pilot. In making the check the Pilot announces over the interphone, "Pilot to gunners, stand by to check controls." He then pulls the control column back and says on interphone, "Check elevators." Left Gunner answers, "Left elevator up, sir." Right Gunner answers, "Right elevator up, sir." The Pilot then pushes the column forward and completes his check on the elevators. Rudder and ailerons are checked in the same manner.

XVIII. Radios Checked.

While Pilot is checking flight controls, Airplane Commander turns on his command set, requests and receives taxi information. Pilot, after checking controls, turns on radio compass and checks for proper operation. He then turns radio compass off and stands by on interphone so that he can be in continuous contact with the crew.

XIX. Altimeters Set.

Airplane Commander and Pilot set their altimeters by the tower altimeter setting. Check the altitude reading against the known field elevation. If the altimeter setting given by the tower indicates an altitude different from the known field elevation, check the setting again and note any difference in elevation so it can be used in correcting the reading when landing.

XX. Turrets Stowed.

Airplane Commander checks the three turret warning lights on his instrument panel to see that all turrets are properly stowed. Turret lights should be out.

XXI. Adjust Seats and Pedals.

XXII. Lights Checked.

If any night operation is contemplated on the flight, all lights must be checked--fluorescent lights, identification lights, landing lights, position lights (all switches on Airplane Commander's aisle stand). A member of the ground crew should be instructed to check the landing lights and position lights. Wing position lights are not visible from the airplane in flight. They can be inspected at night from inside the airplane only by checking the reflection on the ground under the wing tips.

XXIII. Oxygen OK.

Airplane Commander and Pilot check their oxygen pressure gages for proper pressure (400 to 425 PSI) and their walk-around bottles (should have same pressure as in system). Auto Mix should be ON, and the emergency valve OFF.

XXIV. Propellers High RPM.

Pilot pushes the propeller switches (aisle stand) to INCREASE RPM and holds them there until the propeller limit lights on his instrument panel flash on. The propellers then will be in high RPM.

XXV. Turbos Off.

Airplane Commander checks to see that the Turbo Selector Dial is set at "0". Turbosupercharger regulators are ready for instant operation at any time since amplifier tubes remain on even with selector dial at "0".

XXVI. Engineer's Report - Check List Complete, Ready to Start Engines.

At this point, if the Engineer has not completed his check list, the Airplane Commander waits before giving the command to start engines.

XXVII. Stand Clear - Fire Guard.

When ready to start the engines both the Airplane Commander and the Pilot give the command "Stand clear to the ground crew (clear right, clear left). When the fire guard is ready, Pilot says on interphone, "Stand by to start engines."

START ENGINES

The engines are started in 1, 2, 3, 4, order, as follows:

1. Fire extinguishers - set selector to engine being started.
2. Master ignition switch - on.
3. Turn boost pump on.
4. Energize 12-16 seconds.
5. Engage starter.
6. When prop has turned one revolution, turn ignition switch on.
7. Prime as needed to start and smooth out engine at 800-1000 RPM.
8. Move mixture control to auto-rich.

When the engine starts, the Flight Engineer ordinarily reports, "Engine operating normally," and will announce that he is ready to start No. 2 engine. A similar procedure is followed for the other engines. Flight Engineer will handle throttles throughout entire starting procedure, keeping RPM between 1,000 and 1,200. When engine is running, Flight Engineer will set throttle at 700 RPM (1,000 RPM if cylinder head temperature is below 150° C). Thereafter Airplane Commander will control throttles except when calling for engine

driven generators and during engine run-up. If Pilot or Flight Engineer sees that an engine is loading up (black smoke or RPM drop or both), he will inform the Airplane Commander. Do not let engines idle below 700 RPM.

STARTING DON'TS

1 Don't start the engines until the "Before Starting Check" has been covered item by item.

2 Don't start the engines until the propellers have been pulled through to eliminate any possibility of fluid locks.

3 Don't jam throttle forward at any time, especially during starting procedure.

4 Don't start the engines until a fire guard is posted.

5 Don't continue to run an engine unless nose oil pressure and rear oil pressure build up within 30 seconds after starting.

BEFORE TAXIING

1. Vacuum OK.

The Pilot asks the Flight Engineer to check vacuum reading. The Flight Engineer, after checking the vacuum reading for both pumps (gage on Engineer's panel should read 3.8" to 4.2" Hg), reports this check to the Pilot.

WARNING: Do not move the vacuum selector valve (Engineer's control stand), except when making this check. Frequent use of the valve will cause unnecessary wear.

2. Gyros Uncaged.

Airplane Commander and Pilot check their gyro instruments to make sure that they are uncaged and set correctly.

3. Instruments Checked.

Airplane Commander and Pilot check their respective instrument panels for proper readings on all instruments.

4, 5, & 6. Alarm Bell, Phone Call Signal Light, and Combat Station Inspection.

Airplane Commander switches on alarm bell (aisle stand) and phone call signal light (aisle stand), then

calls for combat station inspection. Pilot repeats this command on interphone and receives acknowledgment in the following manner: Bombardier, Navigator, Flight Engineer, Radio Operator (in that order) acknowledge that they have completed a check of their stations by saying, for example, "Bombardier OK." Top Gunner says Alarm bell OK., light OK., Top Gunner OK." Left and Right Gunners say, "Light OK., Left (or Right) Gunner OK." Tail Gunner says, "Light OK(radar compartment), Tail Gunner OK."

7. Chocks Out.

Airplane Commander and Pilot check to see that chocks have been pulled.

8. Parking Brakes Off, Stand by to Taxi.

After releasing the parking brakes, the Airplane Commander gives the command "Stand by to taxi." The Pilot repeats the command over the interphone.

TAXIING PROCEDURE

Like all tricycle-landing-gear airplanes, the B-29 taxies easily. Brakes are good - 4 expander tubes per wheel. However, REMEMBER, it is a big heavy airplane. It gains momemtum rapidly and, because of its size, you will have to depend on your Side and Top Gunners to act as observers to warn you of obstacles.

For all ground operations, set RPM at 700-1000 (after CHT reach 85°C) and mixture in automatic rich. Never use auto lean for taxiing. If carburetors are set properly, engines will idle as low as 550 RPM without loading up.

For maximum cooling and prevention of backfires, it is recommended that the airplane be taxied with brakes alone, controlling both speed and direction with brakes. Entering a taxi turn with outside throttle doesn't save your brakes, in the long run, because the speed of the airplane accelerates quickly with this extra power and brakes must be used to slow down. If you gain too much speed, bring the airplane almost to a stop, straight ahead, then stay off the brakes as long as possible to let them cool. Don't ride your brakes. Don't pivot on one wheel.

Like most airplanes, the B-29 "weathervanes" into the wind. For this reason, when taxiing in a strong crosswind, set upwind, outboard throttle at more than 700 RPM to prevent excessive use of down wind brake.

BEFORE TAKE-OFF

1. Bomb Bay Doors Closed.

After the Pilot has instructed the gunners and Radio Operator to check and see that all members of the ground crew are clear of the bomb bay doors, he says on interphone, "Close bomb bay doors." Flight Engineer then sets throttle on coolest engine within operating limits to 1400 RPM and turns that generator on. The Radio Operator and one of the gunners check through the pressure doors and report to the Pilot that the bomb bay doors are closed. The Flight Engineer then returns throttle to 700 RPM. (On airplanes having the pneumatic bomb bay doors, the doors will not be closed until after the taxi roll has started.)

2. Emergency Brakes Checked.

After parking brakes are released, when starting to taxi, Pilot says, "Emergency Brakes." Airplane Commander then pulls the emergency brake hand metering levers (Airplane Commander's aisle stand) to see that emergency brakes are operating properly on both sides. Pilot then tells Flight Engineer to recharge emergency system. Normal brakes may be safely used while recharging the emergency system, since the electric hydraulic pump recharges both systems with the hydraulic servicing valve on emergency.

3. Airplane headed into the wind.

4. Nose Wheel Straight.

Airplane Commander parks aircraft directly into the wind to insure maximum cooling during engine run-up. Pilot checks through cockpit floor observation window to make sure the nose wheel is straight.

5. Engine Run-up.

The Airplane Commander gives the command "Stand by for Engine Run-up," and the Pilot repeats the command over the interphone. The Engine run-up for first take-off should be accomplished in the following manner: (For subsequent take-off, items a through f. may be eliminated.)

a. Airplane Commander increases all throttles to 1500 RPM and commands "Check generators." Pilot starts flaps down (switch on aisle stand) and tells Flight Engineer to check

generators. Pilot holds switch DOWN until flaps have reached the 25° position then returns them to the up position. Flight Engineer will have generators checked by the time the flaps have been run to the 25° position and back to the up position. NOTE: Flaps are run down at this time in order to have an electrical load on the normal bus so the Flight Engineer can properly check the generators.

b. Airplane Commander operates all four propeller switches to full decrease then to full increase (from limit warning light to limit warning light) to test the propeller governors. At full decrease RPM, before returning switches to increase RPM, check tachometers for stable, uniform readings of 1200-1300 RPM. When props are again returned to high RPM, tachometers should all read 1500 as before. (Any malfunction tendencies such as excessive prop lag should be noted and corrected before take-off)

c. When props and generators are checked, Airplane Commander pulls all throttles back to 700-100 RPM and tells Flight Engineer to check magnetos.

d. Flight Engineer checks the MP at 2200, then when magneto check is finished he advances throttle to full open for a full power, no boost, check. On this check, Flight Engineer looks for indications of an induction leak, waste-gate mal-positioning, dead cylinder due to bad valve and/or broken fuel injection lines. Engine malfunction will reduce RPM and MP. Mal-positioned waste-gate or an induction leak between turbo and carburetor will cause high MP and RPM

e. Magneto and full power no boost check is made on each engine, then RPM is returned to 700-1000.
Allowable drop at 2200 RPM is 100.

f. If RPM drop on any engine is more than 100,

caused by fouled plugs, proceed with full power check for that engine. Then check magnetos (turbos off) on bad engine again. If RPM drop is still above 100, return ship to the line.

g. After magnetos are checked, Airplane Commander sets turbo selector on No. 8 and advances throttles one at a time full open to check manifold pressure and RPM. For this ground check gages should read between 2500 and 2600 RPM and 46 1/2 and 47 1/2 inches of manifold pressure -- deduct 1/2 inch manifold pressure for each 50 RPM. On modified engines, gages should read 49 inches and 2800. See take-off procedure. WARNING: Do not check magnetos with turbos on. A backfire at this time (with turbos on) can damage turbo and waste gate assembly. Do not park airplane at 45 deg. to runway for engine run-up. Head airplane directly into the wind for maximum cooling.

6. Wing flaps 25 deg.

Pilot puts flaps down to 25°. Gunners check the lowering of the flaps by reporting "Left flap down 25°, sir" and "Right flap down 25°, sir".

7. Trim Tabs Set.

The Airplane Commander checks all trim-tab controls -- rudder and aileron neutral, elevator as needed according to the calculated position of the center of gravity.

8. Auto Pilot Off.

The Airplane Commander makes sure all switches (Airplane Commander's aisle stand) are off, with turn control centered.

9. Windows and Hatches Closed.

As the Airplane Commander closes and secures his window, the Pilot closes his, checks to see that the forward compartment entrance hatch is closed, and checks over the interphone with the tail gunner to make sure that the rear entrance door is closed. The rear escape hatch may be left open, on take-offs and landings, as a safety precaution in the event of an emergency landing.

10. Turbos on No. 8

11. Propellers high RPM.
12. Crew Ready.
The Pilot says on interphone, "Prepare for Take Off."
13. Radio Call Completed.
Airplane Commander calls tower and requests permission to take off.
14. Throttle Brake OK. Stand by for take-off.

TAKE-OFF PROCEDURE

Cylinder head temperatures should be kept to a minimum before take-off. If field conditions permit, stop the airplane soon after leaving parking space, complete engine run-up, then taxi to normal run-up position and complete check list. Never start take-off with any cylinder head temperature above 220° C as cylinder head temperature will exceed 260° during take-off. If unusual conditions cause cylinder head temperature to exceed 220°, the engines can usually be cooled by idling at 700 RPM and facing directly into the wind.

Airplane Commander uses throttles (not brakes) to line up with runway, then as airplane starts to roll, throttles should be "walked" forward slowly until Airplane Commander has rudder control at 60 to 65 MPH. Airplane Commander can then move throttles steadily forward to full open position. In this way he can maintain directional control first with throttles, then with rudder. Brakes should not be used to hold the airplane straight on the runway, except in emergencies, since this increases the take-off distance and wears out the brakes. If the Airplane Commander is careful not to use brakes, the airplane will gain speed continuously from the point of run-up (off the runway) to the point where wheels leave the ground.

The Pilot must, during take-off, make a continuous power check as the throttles are advanced even though full power check has been made before take-off. If any discrepancy is noted in power reading it will be brought to the Airplane Commander's attention immediately. For late model airplanes with new type propeller speeder springs, take-off power will be 49 inches and 2800. Tachometers and manifold pressure gages are red-lined accordingly. Unmodified airplanes are red-lined at 47 1/2 inches and 2600.

Full power take-offs are not harmful to the engines so long as CHT stay within limits. Take-offs with reduced power prolong the time necessary to reach 195 MPH. Flying the B-29 below this speed after take-off is relatively hazardous, in the event of engine failure, and does not properly cool the engines.

At 90 MPH, relieve pressure on the nose wheel by easing the control column back. The airplane will then fly itself off the ground at 115 to 130 MPH, depending on the gross weight. As soon as the ship is safely off, Airplane Commander brakes wheels and calls for gear up.

NOTE: Don't pull the nose wheel off of the ground. Just relieve pressure so as to lengthen the oleo strut. For the ideal take-off the nose wheel will not be more than one inch from the ground during any part of the take-off roll. The airplane will become airborne in a good safe flight atitude which will facilitate a steady climb and a rapidly accelerating airspeed.

At 140 MPH, Airplane Commander calls for power condition two (43 1/2 inches and 2400).

At 150 MPH, Airplane Commander calls for flaps up easy. Flaps may be raised 5° at a time if Pilot waits for the airplane to fly out of the tendency to settle, before raising flaps another 5°. Gear and flaps pull a total of 965 amps and may be safely raised together, provided 4 generators (put-put included) are operating and provided switches are not tripped simultaneously.

When gear and flaps are full up the Gunners report, "Right gear and flaps full up, sir", "Left gear and flaps full up, sir".

Manifold pressure is reduced with turbo selector dial until turbos are off, at which time Pilot announces to Flight Engineer, "Turbos off." Subsequent manifold pressure reductions are made with throttles.

Cowl flaps which are 15° open as the ship takes the runway, are closed to 7 1/2° or less by the time the airplane leaves the ground. This setting permits rapid acceleration of airpseed and should keep all cylinder head temperatures below 260°.

Conversion Table on Short Cord Cowl Flap Openings:

15 deg.	same as	3 3/4	in.
12 deg.	" "	3	in.
7 deg.	" "	2	in.
2 deg.	" "	1	in.
0 deg.	" "	5/8	in.

If cylinder head temperatures rise above 260° on take-off, or stay above 248° after the first power reduction, Flight Engineer should open cowl flaps on the hot engine to a maximum of 10° (Never open cowl flaps more than 10° in flight. Larger openings provide very little cooling and decrease cruising ranges considerably. Cowl flaps should be set at the smallest opening which will keep cylinder head temperatures below the required maximum - see section on power plant).
NOTE: For all take-offs, both day and night, first climb to 500 feet above the terrain with a minimum airspeed of 160 MPH. Then, before continuing the climb, level off until reaching climbing airspeed (195 to 205, depending on weight), and until CHT fall below 248° C.

CLIMB

Rated power, 43 1/2 inches and 2400 RPM, will be used for all climbs regardless of gross weight. Climbing airspeed should be 195 MPH for gross weights under 115,000. At higher gross weights, climb at 195-205 MPH.

During a sustained climb, if all cylinder head temperatures are running high, hold climbing power setting and level off until cylinder head temperatures return to normal, then start climbing again.

For take-off, intercooler flaps are full open. For climb and cruise, adjust intercooler flaps to get lowest CAT. However, if conditions are likely to produce ice, adjust intercooler flaps to hold CAT of 25° to 38° C. With turbos off, intercooler flaps should be completely closed.

CRUISING

For each RPM setting, whether climbing or cruising, there is a definite manifold pressure setting. Using more manifold pressure may cause detonation; using less manifold pressure wastes fuel. Form the habit of using related power settings at all times and control your cylinder head temperatures with airspeed.

Before cruising, climb above desired altitude 500 ft. Then hold climbing power settings at zero rate of climb until reaching 210 MPH. 210 MPH will put the airplane "on the step." Then set predetermined cruising power setting, open cowl flaps to 10° and descend to desired altitude at 210 MPH. When reaching desired

altitude, close cowl flaps to 3° or less, and use elevators to hold predetermined cruising airspeed. (On all training missions, except during bombing runs, airplanes will be flown at indicated airspeeds to give maximum range performance for gross weights involved. See Cruising Control Section in "Standard Procedures for Flight Engineers".) Vary power settings slightly to maintain altitude. If cylinder head temperatures are normal when cruising altitude is initially reached, the above procedure may be eliminated and the following substituted: Level off at cruising altitude and hold climb power setting until airspeed builds up to 210 MPH. Then reduce to predetermined power setting. After airspeed is established, cowl flaps may be opened or closed individually to maintain cylinder head temperature within limits. Always reduce manifold pressure first, then reduce RPM, to avoid excessive B.M.E.P.

By setting cowl flap openings as low as possible, by closing intercooler flaps as soon as turbos are off, and by flying "on the step," you should cruise at indicated airspeeds running from 180 to 210 MPH, depending on your gross weight. Mixture control settings should be automatic rich for power settings above 31 inches and 2100. At 31 inches and 2100 or less, mixture should be in automatic lean. Never, under any circumstances, should mixture be set on manual lean--the position between idle cut-off and automatic lean.

NOTE: When it is necessary for any crew member to crawl through the tunnel, he must be cautioned not to use the pressure door hinge as a step. Using this hinge as a step will bend it so that the pressure door will not seat properly.

STALLS

B-29 stalling characteristics are entirely normal. The airplane should be stalled for practice at not more

than 15 " Hg. Aileron control prevails up to, but not during the stall. Rudder and elevator control remain throughout the stall itself.

WARNING: To avoid a violent secondary stall during the recovery, lower the nose slightly, pick up airspeed, then apply power gradually.

POWER-OFF STALLING SPEEDS (INDICATED AIRSPEEDS)

Gross Weight	Flaps Up	Flaps 25°	Flaps Full
140,000	145	131	119
130,000	140	126	114
120,000	135	121	110
110,000	129	115	105
100,000	123	110	100
90,000	117	104	95
80,000	110	98	89
70,000	103	92	84

BEFORE LANDING

1. Notify Crew - Prepare for Landing.

For transition missions, with landing gear extension and retraction cycles permitted every 20 minutes, the airplane will not have to leave the traffic pattern. The before landing check will in such cases start on downwind leg. But when returning to the local area and intending to enter the pattern for a landing, the before landing check will begin about 10 minutes before landing. The Airplane Commander announces, "Prepare for Landing." Pilot repeats the command over the interphone, at which time Tail Gunner starts the put-put. Crew members acknowledge in the following order: Bombardier, Navigator, Flight Engineer, Radio Operator, Top Gunner, Left Gunner, Right Gunner, and Tail Gunner.

2. Radio Call Completed.

The Airplane Commander calls the tower for landing information.

3. Altimeters Set.

Airplane Commander and Pilot set their altimeters to the altimeter setting given by the tower.

4. Trailing Antenna In.
5. Auto Pilot off.
6. Turrets Stowed.
7. Hydraulic Pressure OK.

The Pilot meters the brake pedals till pressure falls below 800 PSI and checks to see pressure is re-

turned to 1000 PSI. Any difference in final pressure should be reported to the Flight Engineer, as Pilot asks him to check emergency hydraulic pressure.

8. Put-put on the line.

The Pilot checks with the Tail Gunner to make sure that the put-put is on the line.

9. Propellers 2400 RPM.

The Pilot adjusts propellers to 2400 RPM.

10. Landing Gear Down and Lights on.

The Pilot, on command of the Airplane Commander, lowers the landing gear and says over the interphone, "Gear is coming down". The side gunners check the main gear and announce in order, "Left gear coming down, sir", and "Right gear coming down, sir". When the gear is completely down the gunners announce again, "Left gear is down and locked," and "Right gear is down and locked". (For all night operation the gunners will use the Aldis Lamp for checking the gear down.) The Pilot checks the nose wheel through the observation window in the floor of the cockpit and checks the landing gear warning lights on his instrument panel. After receiving Pilot's report that gear is down, Airplane Commander will check and state, "Red light off, three green lights on".

NOTE: The indicated airspeed MUST BE LESS than 180 MPH before the gear is lowered.

This visual check by the gunners and the Pilot is most important. The red warning light and the green down and locked lights (and the landing gear warning horn, on early models) all operate from the gear motor limit switches. Remember this--the lights and the horn are NOT position indicators. They mean only that the limit switches have stopped the operation of the gear motors. If the switches open the circuit too soon, the gear will be only partly down and warning of this danger can come only from the visual check. The gear will support the weight of the airplane if the retracting screw is not more than 4 inches from the full down position (the screw itself retracts as the gear lowers). The gear is not designed to support the airplane if the screw is extended more than 4 inches.

11. Engineer's Report.

The Flight Engineer gives the weight and CG figures to the Pilot.

12. Stall Speed.

The Pilot finds the stalling speed based on the weight by referring to the table mounted on his instrument panel and informs the Airplane Commander.

13. Wing Flaps.

At the Airplane Commander's command, the Pilot extends the wing flaps 25° just before turning on base

turned to 1000 PSI. Any difference in final pressure should be reported to the Flight Engineer, as Pilot asks him to check emergency hydraulic pressure.

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13. Wing Flaps.

At the Airplane Commander's command, the Pilot extends the wing flaps 25° just before turning on base

leg. Later, on the final approach and at the command of the Airplane Commander, he extends full flaps at which point the Airplane Commander retrims the elevators. The Side Gunners check position of flaps and inform the Pilot over the interphone.

14. Turbos on No. 8.

Airplane Commander will call for turbos on base leg. Pilot will announce, "Turbos on," to Flight Engineer and turn Selector Dial to "8".

LANDING PROCEDURE.

FINAL APPROACH

Don't put down full flaps until you are lined up with runway and sure of making the field. Go-arounds (see Emergency Procedures) are difficult only when full flaps are down. After putting down full flaps, maintain an airspeed of 30 MPH, indicated, above the power-off stalling speed. Don't "chop" the power at any point on the approach.

Long approaches are not necessary, even when landing on narrow runways (see traffic pattern next page), but the base leg will normally be placed farther out than for a B-17 or a B-24.

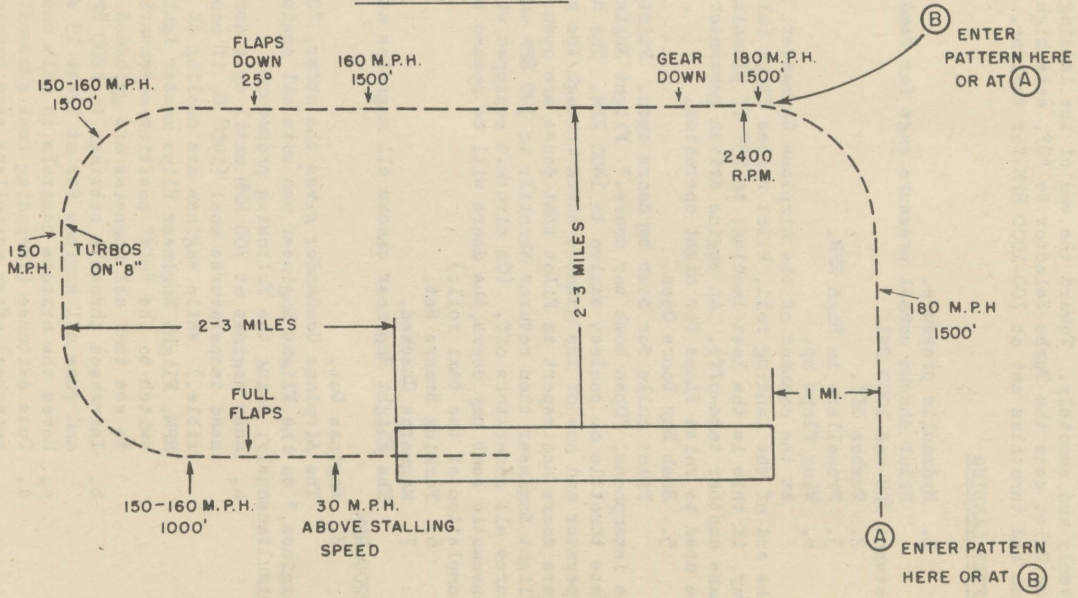
CROSSWIND LANDINGS

Although there is good aileron, rudder, and elevator control throughout the landing approach, remember that the B-29 because of its weight and size, is slow to respond to control movements. When making a crosswind landing, lower the wing on the upwind side and then raise it just before the wheels touch by applying a little throttle to the outboard engine on the low side. Make fairly long approaches on crosswind landings to give ample time to make drift corrections.

LANDING ROLL

Don't use your brakes more than necessary after the wheels touch the ground. On a long runway, let the airplane roll until it loses speed. Lower the nose gently at 90 MPH, and when nearing end of runway, apply brakes

TRAFFIC PATTERN



evenly and smoothly. Toward the end of the landing roll, the Pilot sets the Turbo Selector to "O", sets high RPM, and had throttles set at 700-1000 RPM for taxiing.

AFTER LANDING

1. Hydraulic pressure.

Pilot checks normal pressure gage for reading between 800 and 1000 PSI.

2. Turbos Off.
3. Propellers in High RPM.
4. Wing flaps up.

At the command of the Airplane Commander, near the end of the landing roll, Pilot raises flaps (all the way, if this is the last landing; to 25° if planning to make another take-off). An engine driven generator will be used to raise flaps for night operation.

5. Bomb Bay Doors Open.

Pilot calls for bomb bay doors open. Pilot says on interphone, "Open bomb bay doors." Flight Engineer sets throttle on coolest engine to 1400 RPM. The Radio Operator and one of the gunners check through the pressure doors and report to Pilot that doors are open. Flight Engineer then returns throttle to 700 RPM and turns all generators off. (On aircraft equipped with pneumatic bomb bay doors, the doors will be opened before completion of the taxi roll.)

6. Parking Brakes Set.
7. Magnetos Checked.

The Flight Engineer checks all magnetos at 2200 RPM.

8. Engines Cut.

The Airplane Commander gives the order, "Cut engines," to the Flight Engineer who cuts all engines simultaneously, using the following procedure:

a. Runs engines at 700 RPM until cylinder head temperatures cool (190° C, if possible.) While engines are cooling at 700 RPM, Flight Engineer flips master ignition switch to the "off" position momentarily to see that all magnetos are grounded out.
b. Increases throttle settings to 1200 RPM and runs all engines for at least 15 sec.
c. Moves the mixture controls to idle cut-off.
d. Cuts switches (including fuel shut-off switches) after propellers stop turning.

e. Orders Tail Gunner to stop put-put.

9. Radios Off.

The Airplane Commander turns off the command set and the Pilot switches off the radio compass.

10. Controls Locked.

11. Wheel Chocks in Place -- Brakes Off.

12. Forms 1 and 1A Accomplished.

The Flight Engineer completes Forms 1 and 1A and presents them to the Airplane Commander for check.

13. Crew Inspection.

Crew members leave the airplane and line up as before to be checked by the Airplane Commander. At this time, defects in the airplane not already noted are reported to the Flight Engineer.

EMERGENCY PROCEDURES

LANDING GEAR

1. Make sure all operating generators and the auxiliary power plant are turned on. (A generator should be turned off only if a malfunction exists.)

2. Check fuse in Airplane Commander's aisle stand. If this fuse is burned out, both the normal gear switch and the landing gear transfer switch are inoperative. Replace fuse and try normal gear switch again. If fuse burns out again, return gear switch to neutral, replace fuse and continue with emergency procedure as follows:

   a. Move landing gear transfer switch to emergency. Make sure that the bus selector switch is in the normal position.

   b. Pull the emergency landing gear release handle and hold until doors are fully open. If doors do not open when handle is pulled, emergency gear motors will in some cases drive the gear through the doors, provided the release handle is held out during operation of emergency motors.
   CAUTION: If more than one gear is defective operate only ONE emergency gear switch at a time. After gear is down and locked, do not operate the emergency motor. There are no limit switches in the emergency system.

3. Operate the emergency gear switch controlling the defective gear. If solenoid fails to close when using emergency gear switch, throw a jumper across the solenoid or close it manually. If defective gear does not move within ten seconds, return emergency gear switch to neutral and proceed as follows: Set landing gear transfer switch to normal and bus selector switch to emergency.

4. Operate simultaneously normal gear switch and emergency gear switch (for defective gear), to the down position. If defective gear does not move within ten seconds, return both gear switches to neutral and proceed as follows: Move landing gear transfer switch and bus selector switch to emergency.

5. Place the emergency gear switch on the defective gear to the "up" position for approximately 10 sec.

Then return switch to the "down" position. If defective gear does not move within 10 seconds, return emergency gear switch to neutral and proceed as follows: As a last resort, turn off all engine-driven generators and move bus selector switch to emergency and landing gear transfer switch to normal. Move emergency gear switch on defective gear to "down" position. When gear is "down and locked", return emergency gear switch to neutral. Turn on all operating engine generators and watch closely for movement of defective gear. If gear does not move, ship may be landed safely with generators on. If defective gear starts to retract, set wing flaps at 25°, set props at 2,00, and service main and emergency hydraulic systems, if necessary. Then turn all engine generators off. Lower defective gear again with emergency gear switch. Land with generators off and bus selector switch on emergency. Stop the ship with as few brake applications as possible. Cut all engines, switches, and put-put while still on runway. Have ship towed to the line. Whether landing was made with generators on or off, ship should be jacked up for a retraction test before any switches are turned on and before any motors are replaced.
NOTE: If nose gear alone fails to extend, check nose gear motor fuse (100 amps) in nose wheel well.

FLAPS

1. Flap switch neutral.

2. Put switch on top of emergency motor "down" or "up" as desired. Motor is normally stowed in flap socket in center wing section, and plugged into emergency bus.

3. Lower or raise flaps as desired with landing gear transfer switch (Airplane Commander's control stand), or bus selector switch (battery solenoid shield) on "emergency". As landing is made using emergency extension of flaps, Airplane Commander should put down full flaps as soon as possible on approach, then, after returning landing gear transfer switch to normal, have switch on flap motor placed in "up" position. This will enable Airplane Commander to raise flaps by means of landing gear transfer switch in the event of a go around.
WARNING: Do not run the motor beyond upper and lower flap limits. This would burn out the motor, as it has no limit switch. For emergency flap operation, don't depend on the hand crank stowed forward of the rear entrance door. This crank is for starting the engines

and will not fit the flap socket.

4. As a last resort, put the normal flap switch "up" or"down" as desired with the landing gear transfer switch on "normal." Then put bus selector switch on "emergency". The switch on top of emergency motor must be in the same corresponding position as the n ormal flap switch, or normal and emergency motors will work against each other. Some airplanes equipped with a manual emergency system have a separate emergency wing flap switch on the pilot's aisle stand.

BOMB BAY DOORS

Emergency Electric Operation of Doors.

1. Install portable motor (normally stowed in center wing section) in forward or aft bomb bay door socket just above socket. Motor switch neutral.

2. Landing gear transfer switch or bus selector switch on "emergency". If bus selector switch is used, put-put must be "on the line."

3. Portable motor switch (on top of motor) to "up" for opening doors, to "down" for closing doors. These switch positions are for forward bomb doors only. Switch positions are reversed for operation of aft bomb doors (see decal on top of motor).

WARNING: This motor has no limit switch. Operation beyond the full open or full closed position will burn out the motor. The engine hand crank will not operate the bomb bay doors (see flaps, above).

Emergency Mechanical Bomb Release.

1. Pull release cable by winding Bombardier's hand wheel 2 1/2 turns clockwise or by pulling emergency release handle (one on Airplane Commander's control stand, another on the forward wall of pressurized compartment, near floor, on port side). The first part of this pull releases the doors, allowing them to open. The second part of the pull operates the bomb release levers, releasing bombs unarmed. Total length of pull about 30".

2. After release with wheel, rewind by turning wheel counterclockwise 2 1/2 turns.

3. Doors may be closed after emergency release by putting bomb door handle in full open position and holding until retracting screw engages door mechanism. Then move handle to "close."

EMERGENCY OPERATION - PNEUMATIC BOMB DOORS

When proper pressure in both normal accumulators is present, and electrical system is out:

To Open Doors

1. Pull emergency release on either airplane commander's position or aft of bulkhead 218 until both doors open.

To Close Doors

1. Turn off master switch and bomb door circuit breaker switch on bombardier's panel.
2. Pull emergency retraction "T" handle aft 218 bulkhead to close forward doors.

WARNING: The forward bomb bay doors must be closed first in order to release the 4-way valve on the rear door. Any effort to close the rear doors first will result in complete loss of air pressure in the rear accumulator.

3. Pull emergency retraction "T" handle on right rear catwalk to close rear doors.

With proper pressure on only one accumulator:

1. Open manual equalizer valve until pressure in accumulators is equal.
2. Operate doors normally.

When pressure is absent from both normal accumulators and emergency accumulators are present:

To Open Doors

1. Pull emergency release "T" handle.

To Close Doors

1. Open emergency actuation valve.
2. Pull emergency retraction "T" handle aft of Station 218 to close forward doors.
3. Pull emergency retraction "T" handle on right rear catwalk to close rear doors.

Emergency Electrical Bomb Release

1. With normal electrical power, salvo release of bombs unarmed is accomplished by closing any one of three salvo switches located at the Airplane Commander's station, Bombardier's station, and right hand sighting station in the aft pressurized compartment. With any one of the salvo switches closed, power goes directly to the bomb door "open" solenoid, salvo indicator lights, and bomb salvo relay.

2. If electrical operation is impossible, opening of the bomb doors is accomplished by actuating the emergency bomb door release situated on the Airplane Commander's control stand. Bombs may then be dropped singly by manually tripping the "release" lever on each bomb shackle.

GO AROUND

1. Notify Flight Engineer that you are "going around".
2. Apply throttle gradually, as needed, and raise flaps to 25°.
3. Set full high RPM.
4. Don't try to climb until reaching a safe flying speed.
5. Raise gear when safely clear of the ground.
6. Proceed as in normal take-off.
7. If necessary, apply emergency power by advancing the Turbo Selector Knob to the No. 10 position. Remember--first raise the flaps to 25°, all in one movement. With full flaps down, airspeed cannot be accelerated and climbing is next to impossible.
8. Go around on fewer than four engines should not be attempted.

FIRE

The B-29 is equipped with a CO_2 system fed by two high-pressure CO_2 bottles mounted in the nose wheel well. Lines from each bottle run to all four engine nacelles. The Flight Engineer can direct the CO_2 charge to the desired engine by turning the selector knob on his instrument panel, and pulling the CO_2 release handle (or both handles, if desired) for the bottle he wishes to use.

Besides the nacelle extinguisher system, each airplane is equipped with three hand extinguishers, two CO_2 and one carbon tetrachloride, for extinguishing cabin fires. One CO_2 extinguisher is located on the inboard side of the Flight Engineer's control stand, the other is in the aft pressurized compartment, aft of the auxiliary equipment panel. The carbon tetrachloride extinguisher is located beside the rear entrance door.

CABIN FIRES DURING FLIGHT

In all cabin fires during flight, IMMEDIATELY PULL THE EMERGENCY PRESSURE RELIEF HANDLE IF THE CABIN IS PRESSURIZED. If the fire is in a rear compartment, use the portable carbon tetrachloride extinguisher first, and if necessary, the CO_2 extinguisher. If the fire is in the forward compartment, use the CO_2 extinguisher mounted beside the Flight Engineer's control stand.

If the cabin fire is caused by an electrical short circuit, the procedure is the same, except that the Flight Engineer must turn all electrical power OFF with the battery and generator switches.

If the cabin becomes excessively smoky or gaseous after using the fire extinguishers, open the bomb bay doors for ventilation. If the fire is extremely bad, and there is danger of an explosion from fuel tanks, sound a series of short rings on the alarm bell, so the crew can prepare to abandon the airplane.

NACELLE OR ENGINE FIRE ON THE GROUND

If the fire is known to be a torching turbo, put it out by increasing throttle setting momentarily. For other engine or nacelle fires on the ground, use the following procedures:

1. Move mixture control to idle cut-off on all four engines.
2. Close fuel shut off valves on all four engines.
3. Turn off booster pump switches for all four engines.
4. Close throttles.
5. Open cowl flaps.
6. Set nacelle fire extinguisher to proper engine. Pull first one, and then, if necessary, the other fire

extinguisher control handle. Flight Engineer will check with the scanner on condition of fire before pulling second control handle.

NOTE: The engine fire extinguisher is for fires in the accessory section and is not effective against fires in the engine itself. If fire is still burning:

7. Turn all ignition switches off.
8. Turn battery switch off.
9. Stop auxiliary power plant.
10. Send crew members for additional ground fire fighting equipment.

NACELLE FIRE IN FLIGHT

Crew member spotting the fire uses "call" position on jack-box and says, "Fire on No._____engine." (If possible crew member will identify fire as to type and location). From this point, at the Airplane Commander's discretion, the following procedure should be used:

1. Airplane Commander feathers propeller and says to Flight Engineer, "Use engine fire procedure No._____."

2. Flight Engineer puts mixture on feathered engine in idle cut-off, shuts fuel valve, boost pump off, turns off ignition and opens cowl flap on dead engine to 10°.

3. Flight Engineer then sets nacelle fire extinguisher to proper engine, pulls first one, and then if necessary the other fire extinguisher control handle.

4. If fire is still burning, and airplane has enough altitude, Airplane Commander places airplane in a slightly nose down attitude and increases airspeed 50-60 MPH in an attempt to blow fire out.

5. While Airplane Commander is accomplishing step 4, Flight Engineer closes cabin air valves and radio operator closes forward pressure door. If smoke has entered cabin, co-pilot opens his window.

NOTE: If fumes in the cabin warrant it, Airplane Commander may have crew put on oxygen masks with "Auto-mix" off.

6. If fire is out of control, abandon the airplane according to prescribed bail-out procedures.

7. If engine catches fire while at low altitude or shortly after take off, Airplane Commander will, if unable to put out the fire make emergency landing, following crash landing procedure if necessary. In case of fire immediately after take off, it will depend on gross weight of the airplane and judgement of the Airplane Commander whether or not an attempt is made to return to the field.

BAIL OUT

Airplane Commander will not give the order to abandon ship until he is sure that altitude is high enough for a safe bail out.

Crew members will not leave the ship until the order is given by the Airplane Commander, who will use interphone and the alarm bell. Three short rings means, "Prepare to abandon ship." If this is followed by one continuous ring, crew members will bail out. Also, the crew will be warned by interphone and an acknowledgment received from each crew member.

When preparing to abandon ship, Airplane Commander will let down below 10,000 feet if possible, release cabin pressure, turn on landing lights, (if at night), and lower gear. Bombardier will open bomb bay doors, salvo bombs, and leave doors open. Pilot will (if ship is over water) pull life raft release handles (forward pressurized compartment to either side of tunnel) and throw overboard the life raft, stowed in forward compartment and order Tail Gunner to throw overboard life raft stowed in rear unpressurized compartment.

1. Radio Operator will broadcast a position report. Crew members will destory all confidential and secret equipment, prepare wounded members for bail-out, then jump out through the following exits:

a. Navigator, Radio Operator, Bombardier, Flight Engineer, Pilot, and Airplane Commander, in that order, through the nose wheel well (Navigator and Radio Operator may exit through forward bomb bay if time and conditions permit).
b. Right Gunner, Left Gunner, Top Gunner, through aft bomb bay.
c. Tail Gunner through rear entrance door.
d. Gunners will report to pilot when ready to abandon ship (exits open and, if over water, equipment jettisoned).

When bailing out, brace your feet against the airplane and dive head first, toward the ground. If at altitude, fall "free" (without pulling ripcord) until reaching 10,000 ft. But if you feel yourself losing consciousness, whatever your altitude, pull ripcord. In any case, check your bailout bottle before leaving ship.

CRASH LANDING, WHEELS UP

The B-29 can be crash-landed with a minimum of

injury to the crew. Land on hard surface whenever possible in preference to sod or dirt. Do not feather props unless engine trouble requires feathering.

With wheels up, drag is reduced considerably, so plan your approach to land short.

1. If feasible, circle landing area until remaining fuel supply is 200 gallons per engine.

2. Clear traffic and call for crash trucks, if possible.

3. Give crew members not essential to crash landing permission to bail out. Remaining crew members will take up crash landing positions. (See next page.) Clear lower turret areas for crash landing, as turrets are likely to tear loose and be forced up into cabin.

4. Drop all bombs, auxiliary bomb bay tanks, flares, and to prevent jamming, leave all emergency escape hatches open, except the bomb bay doors. Drain oxygen system.

5. Close wheel well nacelle doors, if possible.

6. Make a normal approach sufficiently far back from the field and high enough to allow remaining crew members to perform the following last minute preparations at the command of the Airplane Commander.

7. Lower full flaps for landing.

8. Stop auxiliary power plant.

9. Shut booster pumps off.

10. Close fuel shut-off valves (toggle switches on Engineer's panel) on final approach when certain of making the field. (Approximately 10 to 15 seconds of fuel, at low power, remains in the lines after closing the fuel shut-off valves.)

11. Just prior to contact with the ground, throttle the engines back and place mixture control in idle cut-off.

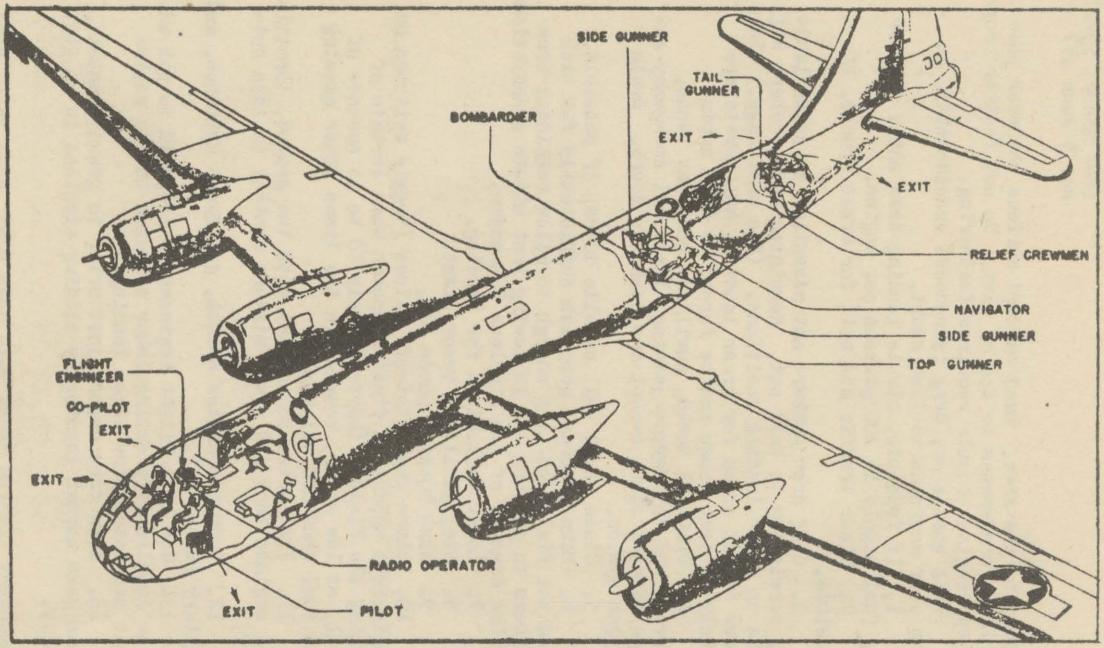
12. Turn the master switch, generator switches, and battery switch off.

13. See that Flight Engineer is prepared to set engine nacelle fire extinguisher selector to any engine that may catch fire after landing.

14. Warn crew member just prior to ground contact, then make normal landing by sliding airplane in on its belly.

<u>EMERGENCY LANDING (Both Main Gear Down, Nose Wheel Partially Up or All the Way Up. On An Airport.</u>

1. Follow steps 1 through 13 as for crash landing.



CRASH LANDING POSITIONS

RESTRICTED

B-29 AIRPLANE

Except for wheel doors (leave open), and load shift disposable load to put CG back as far as possible), then proceed as follows:

a. Hold the nose of the airplane in the air as long as possible with the elevators and then lower it gently until it strikes the runway.
b. After the nose of the airplane strikes the runway, apply brakes as necessary to bring airplane to a stop.

EMERGENCY LANDING (One Main Wheel Up, Nose Wheel and One Main Wheel Down) On An Airport.

1. Follow steps 1 through 13 as for crash landing, except for wheel doors (leave open). Then proceed as follows:

a. Make normal landing on good wheel with the wing tip slightly low on the good wheel side.
b. Hold the wing on bad wheel side up as long as possible with ailerons.
c. Be prepared for an extremely sharp ground loop in the direction of the crippled wheel, when the wing tip and the nacelle dig into the runway. Use brakes to minimize ground loop.

EMERGENCY LANDING (One Main Wheel Down, Nose Wheel and One Main Wheel Up) On An Airport.

1. Follow steps 1 through 13 as for crash landing, except for wheel doors, then continue as follows:

a. Make normal one-wheel landing on the good wheel.
b. Hold up nose with elevators, and the wing tip on the bad wheel side with ailerons, as long as possible.

NOTE: IF EITHER MAIN GEAR CAN BE EXTENDED AND LOCKED, LAND WITH THIS ONE GEAR EXTENDED. IN CASES WHERE NEITHER MAIN GEAR CAN BE LOWERED ALL THE WAY, RAISE ALL WHEELS IF POSSIBLE AND MAKE A CRASH LANDING. LAND ON HARD SURFACE IN PREFERENCE TO SOD OR DIRT.

Emergency Landing Off An Airport Raise All Wheels and make A Crash Landing.

EMERGENCY LANDING GEAR OPERATION (Manual)

A manual system for the extension and retraction of the landing gear is installed in the new production airplanes. The system is composed of a hand crank for each main gear and crank for the nose gear, torque tubes, and gear boxes to actuate the landing gear screws. Clutches disconnect the normal motors from the screws during emergency operation. The clutches on the main gears also disconnect the manual system which does not turn during normal operation of the gears.
NOTE: This system can also be actuated by the portable wing flap motor.

MAIN GEAR

a. The main gears are each operated manually from a gear box installed just aft of the rear wing spar and above each catwalk in the rear bomb bay. The box on the right hand side actuates the left gear. A hand crank, which is inserted in the gear box during manual operation, is stowed just above the catwalk at station 520. In B-29A's, this crank is located on the rear spar bulkhead. A crank is provided for each gear. From each gear box, a torque tube projects outboard through the wing trailing edge ribs to a right angle gear box near wing station 137. From the gear box another tube projects forward to a gear box on the rear side of the front spar from which a short tube goes to the gears that actuate the landing gear screw. The clutch that disconnects the normal electric motor from the screw and engages the manual system is cable operated from the same pull handle that operates the emergency nacelle door release. A single cable runs from the handle to a quadrant mounted on the rear side of the front spar in the wheel well, then over a pulley on the clutch release lever to a tension spring. The cables actuating the nacelle door releases are operated by the quadrant. The pull handle formerly located on the Airplane Commander's control stand is now

replaced with two handles, one on each side of the airplane, at bulkhead 485. The handles are within easy reach of the crew members at the hand cranks.

b. To operate each main gear with this emergency system:

(1) Pull the nacelle door release and clutch engagement handle. Allow the swaged ball on the cable to drop into the slot on the handle bracket which retains the cable in the extended position. This puts a spring tension on the clutch lever, which subsequently moves to mesh the clutch when the jaws are aligned. The engagement of the clutch on the manual side is simultaneous with the release of the clutch on the motor side.

(2) To raise the gear manually, insert the crank in the upper position on the gear box. Turn clockwise until the stops engage. About 30 minutes will be required to complete the 774 turns. It is necessary to use the upper position with its gear ratio of 12 to 1 to lighten the crank loads when raising the gear.

(3) To lower the gear manually, insert the crank in the lower position. Turn clockwise until the stops are engaged. The gear ratio is 6 to 1, and 387 turns are required. This takes about 12 minutes.

(4) To operate the gear by emergency power, install the portable auxiliary flap motor in the lower position. BE SURE THE CLUTCH HAS BEEN SHIFTED. The switch directions are noted on the motor handle. Run the motor until the stops engage. A jar will occur, and the motor clutch will start slipping. One minute is required for retracting, 40 seconds for extending. The motor is normally stowed on the center wing section and is plugged into a power receptacle. The cord on the motor has been lengthened to make it possible to reach both gear boxes from this receptacle.

(5) ALWAYS RETURN THE CLUTCH HANDLE TO THE "IN" POSITION IMMEDIATELY AFTER EMERGENCY EXTENSION OR RETRACTION IS COMPLETE. This will cause an internal spring in the clutch mechanism to release the emergency manual system and engage the normal electric motor. Since the retraction motor is series wound, it will develop excessive speed and destroy itself if run with the load removed. Therefore, it should always remain engaged except when the emergency system is actually being used.

NOSE GEAR

a. To operate the nose gear manually:
(1) Remove the beam from the clamp on the Pilot's armor plate stanchion and rotate to a horizontal position.
(2) Secure the beam with eye bolt and wing nut to the bracket on the Airplane Commander's plate stanchion.
(3) Remove the hand crank from under the entrance hatch and insert into the square hole in the beam.
(4) Unscrew the pressure sealing plug in the floor, using the hand crank as a wrench.
(5) Insert the crank in the gear box.
(6) If the crank will not turn, open the entrance hatch and disengage the motor with the clutch lever. Moving the lever toward the right (facing forward) disengage the motor. A spring that attaches to either of two clips is provided on the handle to retain it in the engaged or released position. Normally, the motor is left engaged and is allowed to rotate as the gear is actuated. The number of turns of the crank required to raise or lower the gear is 257, and the gear ratio is 3 to 1. Extension and retraction are each accomplished in two to three minutes.
(7) ALWAYS RETURN THE CLUTCH HANDLE TO THE ENGAGED POSITION AFTER HANDCRANKING if

the clutch has been released. Also remove the crank and stow the beam.

NOTE: Instruction decals are installed in the airplane to explain the operation of the manual retraction system. A decal is provided above each gear box at the cranking stations for the main gears. A decal is also provided on the back of the Pilot's armor plate for instructions regarding the nose gear.

DITCHING

Ditching the B-29 in its present configuration is a special problem, completely different from any other airplane. The large bomb bay doors and the extreme length of the fuselage have caused the following conditions in ditchings so far experienced by B-29 airplanes:

a. Bomb bay doors usually collapse unless modified to strengthen.
b. A wall of water breaks down the front door of the rear pressurized compartment.
c. The entire tail section fills with water and sometimes breaks off and sinks.

Modifications now in engineering will provide:

a. Reinforced bulkhead pressure door.
b. Reinforced bomb bay doors.
c. Escape hatch on top of rear pressurized compartment.
d. Ditching belts.

DITCHING DRILL

Successful ditching depends on constantly repeated drill. Reactions must be automatic. The procedure must be as orderly as possible. Equipment needed after the plane has been abandoned must not be left behind. The whole crew must practice together the coordinated steps of the ditching procedure just as often as possible. Wet ditching drill, the actual launching and boarding of life rafts in water, is preferable. If there are no facilities for wet ditching drill, practice the ditching procedure in your own plane under simulated conditions. Learn your job. Learn the job of every man in the crew so that nothing can be overlooked.

WIND DIRECTION

Study the appearance of the sea in relation to wind speed and direction. Try to become thoroughly familiar with surface conditions; they are an index to the wind. Waves move downwind, but the foam of the crest appears to slide down the back, the windward, side of a breaking wave. Spray from wave crests is blown downwind. Swell is a rising and falling of the surface of the sea; swell does not indicate wind direction.

WIND SPEED

1. A few white crests. . . . . 10-20 MPH
2. Many white crests . . . . . 20-30 MPH
3. Streaks of foam along water . 40-50 MPH

ALTITUDE

Altitude is difficult to judge when the surface of the sea is smooth. Radio Operator should lower trailing antenna until it strikes the water, and notify the Airplane Commander when current drops.

HANDLING THE AIRPLANE

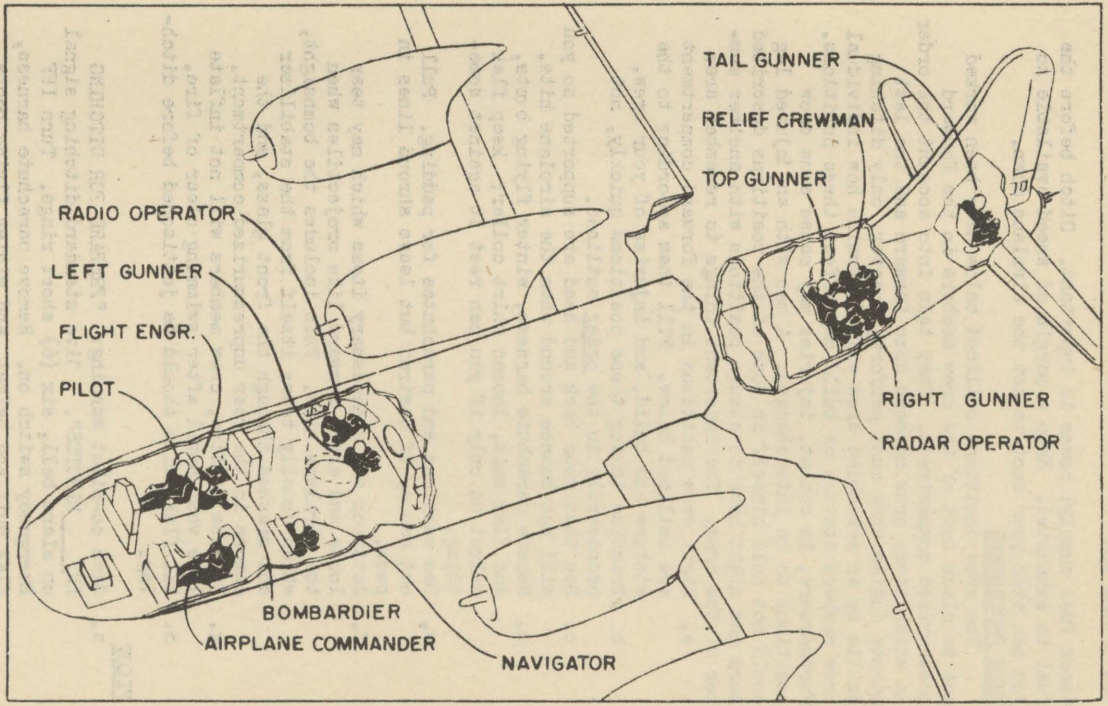
Ditch along the top of a steep swell. Ditch upwind in a long shallow swell. If there is a crosswind over 20 MPH ditch into the wind. If ditching into the wind involves ditching across a swell, put the airplane down on an upslope toward the top. After flattening out try to keep the airplane from striking the water until all excess speed is lost. If the airplane alights tail down, there will be a jolt as the tail strikes, followed by a severe impact and violent deceleration. If you come in too fast on a calm sea, there will be a tendency to bounce; hold the control column back hard. In a sea with average size waves, the tail will touch the crest of the wave first. Keep the nose up so the forward part of the airplane will touch the next wave crest approximately under the center of gravity. The airplane "boats," but if the nose submerges, it will hold.

PREPARATIONS

When an emergency develops making it doubtful as to whether or not you will reach land, start your preparations for ditching at once. Start with the preliminary radio procedure. Don't wait for the situation to improve. Experience indicates radio signals sent prior to ditching are the best aid to searchers. If you are able to make land, cancel the SOS, so that you won't waste the time of other crews and jeopardize their safety.

NOTE: If it is necessary to bail out over water, Airplane Commander should place the airplane in a bank and circle while life rafts and other equipment are being thrown overboard. Crew members should bail out as near as possible to emergency equipment.

Any time the signal to prepare for bail-out is given, the crew members in the rear of the airplane should report when they have opened exits and are ready to abandon ship.


TAIL GUNNER
RELIEF CREWMAN
TOP GUNNER
RADIO OPERATOR
LEFT GUNNER
FLIGHT ENGR.
PILOT
RIGHT GUNNER
RADAR OPERATOR
BOMBARDIER
AIRPLANE COMMANDER
NAVIGATOR

Check fuel supply; power is important. Ditch before the fuel is exhausted. Keep a margin of speed available so you can pick your spot to set the airplane down.

CREW PROCEDURES

The crew positions outlined below have been worked out to place most of the crew members in the forward pressurized compartment. They take into account the order in which those crew members come forward and the last minute duties they must perform; however, only ditching drills by an assembled crew will determine how individual crew members stature or build may affect these positions. Furthermore, in combat, injuries may cause some crew positions to be interchanged. A man with an injured leg could not hold himself in some of the positions described here and might have to change positions with another member of the crew. The important things to remember are:

a. Eight crew positions in the forward compartment are outlined below. Fill them according to the stature and build, and injuries of your crew.
b. Practice taking these positions quickly, not necessarily in the order outlined.
c. See that your back and head are supported so you will not bounce around when the airplane hits.
d. Remove parachute harness, winter flying boots, and flak suit, loosen shirt collar; keep flak helmet on only if you can rest it against something.
e. Use cushions and parachutes for padding. Pull out canopy if desired but leave shroud lines in pack.
f. Jettison all unnecessary items which may tear loose and crash forward like projectiles when the airplane hits. This includes the bombsight, which usually tears itself from the stabilizer and crashes through the front glass, and the camera in the rear unpressurized compartment.
g. In case of fire, crew members will not inflate life vest until after swimming clear of fire.
h. All flak suits should be jettisoned before ditching.

PILOT

a. Give co-pilot warning: "PREPARE FOR DITCHING IN____MINUTES". Give standard ditching signal on alarm bell, six (6) short rings. Turn IFF Emergency switch on. Remove parachute harness, flak suit and helmet, and winter flying boots.

Fasten safety belt and loosen shirt collar. Wear flying gloves.

b. Advise any nearby aircraft of distress by radio, and then turn to interphone.

c. Give co-pilot order: "OPEN EMERGENCY EXITS AND THROW OUT EQUIPMENT." If possible, give this order above 5,000 feet.

d. Give co-pilot order: "STATIONS FOR DITCHING. IMPACT IN SECONDS." If possible, give this order above 2,000 feet. Open window, brace feet on rudder pedals, knees flexed. About five (5) seconds before impact, give co-pilot order: "BRACE FOR IMPACT." The aircraft should touch the sea in a normal landing attitude (about 5 degrees).

e. Check to see that crew is clear of forward compartment, then exit through left window. Inflate life vest when on window ledge. Climb atop cabin, thence to left wing. Secure left life raft or pull outside release handle, if necessary.

CO-PILOT

a. Relay pilot's command over interphone: "PREPARE FOR DITCHING IN_____MINUTES." Receive acknowledgments. Tell the pilot: "CREW NOTIFIED."

b. Remove parachute harness, flak suit and helmet and winter flying boots. Fasten safety belt and loosen shirt collar. Wear flying gloves.

c. Stand by on interphone to relay pilot's orders.

d. Relay order: "OPEN EMERGENCY EXITS AND THROW OUT EXCESS EQUIPMENT" and check on crew's progress.

e. Relay order: "STATIONS FOR DITCHING. IMPACT IN____SECONDS." Open side window, brace feet on rudder bar with knees flexed. Thirty seconds before impact, order radio operator to abandon his key and take station. When pilot gives order: "BRACE FOR IMPACT", send one long ring on alarm bell.

f. Take aeronautical first aid kit stored above engineer's seat and exit through right window. Inflate life vest on window ledge. Climb atop cabin, thence the right wing. Secure right life raft or pull outside raft release handle, if necessary.

FLIGHT ENGINEER

a. Acknowledge in turn: "FLIGHT ENGINEER DITCHING."
b. Remove parachute harness, flak suit and winter flying boots. Keep flak helmet on loosen shirt collar. Wear flying gloves.
c. Open front emergency hatch and acknowledge to co-pilot: "FRONT HATCH OPEN." Pass it back together with any other loose equipment to be jettisoned through front bomb-bay.
d. Take regular position facing aft and keeping to your left, head and shoulders braced against co-pilot's armor plate, safety belt fastened, hands braced against control stand.
e. Take raft accessory kit, if carried in aircraft from shelf behind escape hatch previously operated.
f. Inflate life vest on window ledge. Climb atop cabin and proceed to right wing.
g. Assist bombardier and co-pilot in securing life rafts.

BOMBARDIER

a. Acknowledge in turn: "BOMBARDIER DITCHING."
b. Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.
c. Destroy bomb sight and bombing data. Jettison the bomb sight so it will not break the front glass.
d. Open bomb bay doors. Assist in jettisoning all loose equipment in forward compartment. Jettison bombs, ascertain that other crew members have finished jettisoning all loose equipment, and then close and check bomb bay doors. Shoot out ammunition from front turrets.
e. Get emergency signal kits from under navigator's desk.
f. Take sitting position on floor with back against co-pilot's armor plate. Squeeze in with the flight engineer and brace right foot across the aisle. Fasten safety belt. Protect head with arm or pillow.
g. Exit through engineer's emergency hatch.
h. Inflate life vest and proceed to right wing.

NAVIGATOR

a. Acknowledge in turn: "NAVIGATOR DITCHING."
b. Remove parachute harness, winter flying boots,

and flak suit. Keep flak helmet on and loosen shirt collar. Wear flying gloves.

c. Calculate position, course, altitude, and ground speed for radio operator to transmit.
d. Give pilot surface wind strength and direction. Destroy classified documents.
e. Gather maps and navigation equipment into waterproof bag or tuck inside clothing. Jettison navigator's chair, if possible.
f. Pass axe from engineer's panel to top gunner.
g. Jettison all drift signal flares through release tube. Assist in jettisoning all loose equipment from front compartment, including tunnel ladder, then close pressure door to bomb bay.
h. Check astrodome to be sure it has been removed.
i. Fold navigator's table upward and slide seat, if not jettisoned, full rear. Sit on floor facing aft with parachute padded or cushioned back up against structure below navigator's table. Rest head against structure.
j. When airplane stops, exit through astrodome.
k. Inflate life vest and proceed to right wing with navigation equipment.

RADIO OPERATOR

a. Acknowledge in turn: "RADIO OPERATOR DITCHING".
b. Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves, if possible.
c. Transmit position, course, altitude, and ground speed as received from navigator on DF. Relay fix or bearings obtained to navigator.
d. Give DF contact all data without waiting too long for answer.
e. Destroy classified material. Check IFF setting.
f. Continue to send emergency signals. On command from co-pilot to take ditching position, screw down transmitter key.
g. Lower the trailing antenna full length, watch current meter and notify pilot of height above water when it grounds (100-110).
h. Remain at radio operator's seat with belt fastened, facing aft, back and head against upper turret wall, as close to center as possible cushioning back and head with parachute, bracing legs against bulkhead.

i. After airplane comes to rest, pull both raft handles, exit through astrodome.
j. Inflate life vest and proceed to right wing.

RIGHT GUNNER

a. Acknowledge in turn: "RIGHT GUNNER DITCHING."
b. Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.
c. Shoot out all ammunition in rear lower turret.
d. Help jettison all loose equipment.
e. Proceed to rear unpressurized compartment. Open and jettison rear exit hatch. Sit facing aft, between left gunner and radar operator, back against bulkhead, hands clasped behind head. Pad back with parachute. Do not support any of the body against the pressure door, as it may fly open on impact.
f. Exit through rear escape hatch; inflate life vest and proceed to left wing.

LEFT GUNNER

a. Acknowledge in turn: "LEFT GUNNER DITCHING."
b. Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on loosen collar Wear flying gloves.
c. Report progress in gunner's compartment over interphone to co-pilot.
d. Shoot out all ammunition in lower rear turret.
e. Be sure pressure door to bomb bay is closed. close door in armored bulkhead.
f. Proceed to rear unpressurized compartment. Close rear pressure door and securely latch. Sit facing aft, back against right side of bulkhead, hands clasped behind head, legs braced.
g. After airplane comes to rest, throw out extra emergency gear and exit through aft hatch. Inflate life vest and proceed to left wing.

RADAR OPERATOR

a. Acknowledge in turn: "RADAR OPERATOR DITCHING."
b. Remove parachute harness, flak suit, and winter flying boots. Keep helmet on and loosen shirt collar. Wear flying gloves.
c. Destroy or jettison radar equipment if near enemy territory.
d. Remain at position as long as pertinent information concerning altitude and other matters may be relayed to pilot.

e. Just before taking ditching position, pull IFF detonator plug.
f. Proceed to rear unpressurized compartment. Remain on interphone, if possible.
g. Take position with back and head against bulkhead, cushioned with parachute, and with hands clasped behind head.
h. When airplane comes to rest, exit through rear escape hatch. Inflate life vest and proceed atop fuselage to right wing.

TOP GUNNER

a. Acknowledge in turn: "TOP GUNNER DITCHING."
b. Shoot out all ammunition from rear upper turret. Check gunners to see that lower rear and tail turret ammunition has been shot away.
c. Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.
d. Proceed forward through tunnel to front pressurized compartment.
e. Be sure front pressure door to bomb-bay is closed and reinforced.
f. Grasp leather thong below astrodome and pull sealing strip away, if astrodome does not fall free, jerk sharply on center stud. A sharp jerk is better than a steady pull.
g. Take sitting position on lower turret well with cushioned back and head up against upper turret well. Brace feet against bulkhead with knees flexed, and protect head with hands.
h. Verify that both life raft release handles at tunnel entrance have been pulled.
i. Exit through astrodome. Inflate life vest and proceed along fuselage to left wing.

TAIL GUNNER

a. Acknowledge in turn: "TAIL GUNNER DITCHING."
b. Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.
c. Shoot out ammunition in tail guns.
d. Jettison escape hatch; remain in seat, safety belt fastened, back and head cushioned, knees flexed.
e. When airplane comes to rest, tail may be low in water or under water.
f. Exit through tail gunner's escape hatch, inflate

life vest, make way forward to left wing.

NOTE:

a. If crew includes an additional man (RCM observer or aerial observer) he will assume prone position in the tunnel, feet braced flexibly against the tunnel wall. Exit through the astrodome to left wing. If convenient, the extra crew member will trade positions with the top gunner, using the taller man in the tunnel. It is suggested that this position be tried for size before the mission.

b. On new models, astrodome can be released and dropped into tunnel by pulling on leather thong. On older models, there may be time enough to break out astrodome with axe. If astrodome is not removable, Left gunner and Radio Operator exit respectively through Airplane Commander's window and Flight Engineer's escape hatch.

If ditching occurs at night, turn landing lights on, providing the reflection does not interfere with the Airplane Commander's vision. Turn off bright lights within the plane, so that you can see better when you get out into the darkness. Turn them on again after landing to guide nearby rescure parties.

Don't jump from plane into rafts; you'll go right through. If a raft inflates inverted don't jump on it to right it. You'll only push out the air underneath and make it harder to turn the raft over. It may be possible for two or more men to right the raft from the wing. This may also be done by getting into the water, climbing up on one side of the raft and pulling on the handline attached to the opposite side of the raft.

Remember, however, that it is better to keep dry, if possible, when the weather is cold.

Fend the rafts off the wings of the plane while launching and boarding them. Wing flaps are usually torn loose in ditching and jagged edges of flaps or wings can easily puncture rafts.

When all men are aboard, tie rafts together to keep them from drifting apart.

Get the emergency radio set into operation as soon as weather permits. The kit is contained in two cases, strapped together, which are brought out of the plane after the ditching by the Radio Operator.

Complete instructions for operating the radio are included in the case.

PROPELLER FEATHERING

1. Throttle closed.
2. Push feathering button and tell Flight Engineer to prepare for feathering. (Don't hold button down. It will pop out when prop is fully feathered.)
3. Fuel Off (mixture, fuel boost, fuel valve).
4. Auxiliary equipment (generators, cabin air valve, vacuum pump) off or transferred to another engine.
5. Cowl flaps and oil cooler shutters closed.
6. Ignition off when prop stops turning.
7. Retrim airplane for balance and power.

NOTE: Propeller feathering, like the emergency landing gear system, is for emergency use only and should not be practiced in training. A new modification also precludes the practice of feathering at any time except in emergency. With this modification, the engine oil will be contaminated with hydraulic fluid after a complete feathering cycle. (Simulated two - and three-engine operation may be practiced by pulling the manifold pressure back to 15 inches.)

UNFEATHERING

1. Propeller - low RPM, throttles closed.
2. Ignition - ON.
3. Push feathering button and hold until propeller reaches 600 RPM and not more than 1000 RPM.
4. Fuel valve and fuel boost pump on - mixture auto-rich.
5. Warm to minimum of 85° CHT and 50° oil tempera- at 1200 RPM then advance RPM.

and throttle.

Think twice before you feather a propeller under emergency conditions, such as engine failure on take-off or landing. Feather a propeller only when you are sure that the engine is creating a drag. Even an idling engine delivers some thrust at relatively low speeds. On take-off it may be delivering just enough to mean the difference between crash landing and going around.

Even if a crash landing is inevitable, do not feather propellers. Balance the power and land straight ahead.

The B-29 propeller feathering system uses engine oil pumped by an electric motor into the propeller dome. If all oil in the main system is lost, a three gallon oil reservoir holds enough oil for feathering, and unfeathering. (An airplane with this reservoir is easily identified. The feathering pump is located directly beneath the main oil tank.)

If engine oil is lost, and the engine cannot be feathered, the greatest danger is from the windmilling prop, its speed depending on your altitude and airspeed.

As an example, if you are operating on three engines at 25,000 feet and 233 MPH, true airspeed, and the dead-engine propeller is windmilling in low pitch, RPM will be about 4,000. Since high speeds can cause centrifugal explosion of the propeller or destruction of the engine, reduce your power and lose airspeed, using flaps and gear, if necessary. At lower altitudes and very low speeds, the windmilling propeller is not likely to exceed the normal RPM limits.

RUNAWAY PROPELLER

1. Throttle back.

2. Keep RPM down by using feathering button intermittently and feather propeller completely as soon as a safe altitude is reached.

NOTE: Normal overspeeding of the propellers up to 3150 RPM, caused by a power surge, should not be confused with a runaway propeller. An overspeeding propeller will normally be returned by the governor to the set speed within a few seconds. Sometimes, after the feathering button has been used to return the prop to normal RPM, the governor will control the prop, if the Airplane Commander is careful not to apply sudden power

to the engine. In this case, do not feather the prop. Just handle the throttles carefully and come in for a landing as soon as possible.

If the nose oil pressure drops below 20 lbs, feather propeller immediately to prevent a runaway propeller, and land as soon as possible.

POWER SURGE

In the event of a strong power surge, pull the amplifier, thus locking the wastegate. If manifold pressure and RPM remain constant within limits, it indicates a faulty amplifier. If surge is not corrected by pulling amplifier, it indicates a faulty propeller governor. Feather propeller and land as soon as possible.

RUNAWAY TURBO

1. Throttle back.
2. Change amplifier (amplifiers mounted forward of Navigator's table).

TWO- AND THREE ENGINE OPERATION

Two- and three-engine operation is essentially the same as in other four-engine airplanes, so detailed procedures will not be given here. Just remember these points if an engine fails on take-off:

1. Get directional control first (balancing power if necessary), then pick up airspeed before trying to climb.
2. Drag with gear and flaps down is excessive, so raise gear immediately and bring up flaps at 150 MPH, even if gear is not all the way up.
3. If you use turbo position No. 10, reduce power as soon as possible.
4. If two engines fail on take-off, be prepared to crash land straight ahead.
5. Because of the large flap area, uneven power should be applied cautiously and gradually, with flaps partly down or full down. A sudden application of power on three engines (or on two engines, if both are on the same side) is likely to force the airplane into a violent maneuver in the direction of the bad engines.

DESCENT CONTROL

Because of interception, necessity for maintaining pressurized altitude at which descent is initiated, and possible effect of adverse winds at lower levels, it is impossible to specify a standard descent procedure for all operating conditions. For all methods descent should be flown at long range cruising air speeds and will result in a saving of 2½ miles per thousand feet descended.

AIRPLANE COMMANDER CHECK-OFF
PROCEDURE B-29 AIRPLANE

(PILOT CHECK-OFF PROCEDURE REQUIRES COMPLETION OF PAR 1 THROUGH 5-f)

NAME_____ ASN_____ RANK_____

PILOT EXPERIENCE_____ YEARS_____

4-ENGINE TYPES FLOWN____ HRS IN B-17_____ B-24_____

PILOT RATING_____ DATE_____

INSTRUCTOR PILOT____ AIRPLANE COMMANDER_____ PILOT_____
(Check Applicable Category)

(After spaces are initialed by Check Pilot, place in individual's Form 5)

1. Complete successfully B-29 Pilot's Questionnaire _____
2. Thorough knowledge of T.O. 01-20EJ-1 and 2AF Manual 50-27, "B-29 Standard Procedures for Pilots." _____
3. Complete one flight as observer _____
4. Complete Missions 1 through 12, "Flight Training Directive for B-29 Superfortress Crews," dated 9 September 1944. _____
5. Make a demonstration flight as Airplane Commander, or Pilot, with a qualified B-29 Check Pilot, wherein airplane capabilities and flight limitations are thoroughly demonstrated by Student Pilot. Such maneuvers to be demonstrated at least once each are as follows:
   a. Taxiing, using unbalanced power for directional control. _____
   b. Taxiing, using brakes for directional control _____

c. Maximum deceleration, using care to avoid locking wheels and injuring tires. _____

d. Use of emergency brakes. _____

e. A minimum of 10 daytime take-offs and landings.
State number of each:
(1) _____ take-offs (Day) _____
(2) _____ landings (Day) _____

f. Night take-offs and landings until proficient.
State number of each:
(1) _____ take-offs (Night) _____
(2) _____ landings (Night) _____

g. Stalls.
(1) Gear retracted, zero wing flaps _____
(2) Gear extended, 25° wing flaps _____
(3) Gear extended, full wing flaps _____

h. Three-engine operation by reducing manifold pressure to 15". _____

i. Operation under conditions of reduced throttles (25" Hg) and 25° flaps extended, demonstrating ease of handling under these conditions at low speeds (135 MPH). _____

j. _____ Number refused landings (go around) _____

k. Shall be checked and passed by a qualified B-29 Check Pilot on green card requirements contained in AAF Instrument Check, AAF Regulation 50-3, 6 March 1944. (Excluding 100 hrs actual instrument time).

6. A minimum of twenty (20) hours of qualified dual instruction before day check, minimum of ten (10) hours of solo transition (daytime) before night solo flight. _____

PRESSURIZATION AND OXYGEN

CABIN PRESSURE

Compressed air for supercharging the fuselage compartments is supplied by the inboard turbos of the inboard engines. After compressed air passes from the impeller into the carburetor air duct, some of the compressed air is directed through the cabin air duct, through the aftercooler, and into the cabin through the cabin air valve. This happens only when the cabin air valve is open.

When the cabin air conditioning system is used, the aftercooler flap is closed to provide heat, opened to provide cooling. With the aftercooler flap closed, hot air from around the exhaust collector ring is directed through the aftercooler to heat the cabin air. With the aftercooler flap open, cool air is directed through the aftercooler, overcoming the heat of compression and reducing the temperature of air going into the cabin.

Air is released from the cabin by two automatic regulators in the rear pressurized compartment, which maintain the following cabin pressures:

0 to 8,000 ft -- Pressure differential of 1 inch
8,000 to 30,000 ft-- Cabin altitude 8,000 ft
30,000 to 40,000 ft-- Cabin altitude increases from 8,000 ft to 12,000 ft

PRESSURIZING PROCEDURE

Under normal conditions, begin pressurizing at 8,000 ft. Close all windows, pressure doors, and the cabin pressure relief valve (under left side of Engineer's seat). Open the cabin air valves on the Engineer's control stand.

NOTE: Be sure that knurled knobs on top of cabin pressure regulators, located at forward end of rear pressure compartment, are unscrewed, as these regulators will not operate if knobs are screwed down. When leveling out for cruising, Airplane Commander sets up predetermined power. If cabin air flow is then too low with cabin air valves full open, Airplane Commander will increase turbo boost slightly and retard throttles to

desired manifold pressure.

Cabin air flow desired is the minimum flow which will maintain cabin altitude (see above table), but never more than 1000 cubic feet per minute and not more than 600 cubic feet per minute at altitudes above 33,000.

For maximum engine efficiency, set turbos to the lowest point which will maintain desired cabin air flow. If cabin pressure regulators are not working properly, screw down the knurled knobs on the cabin pressure regulators, then regulate cabin pressure with cabin air valves and cabin pressure relief valve.

When operating above 20,000 feet the Flight Engineer should not allow cabin pressure differential to exceed 13.34 in. of Hg. Close cabin air valves enough to prevent higher differentials.

Either the Airplane Commander or Pilot in the front pressurized compartment, and one crew member in the rear pressurized compartment will use oxygen when pressurized above 10,000 feet. Each remaining crew member will have his oxygen mask attached to left side of his helmet with mask hose plugged into oxygen system ready for instant use. If the cabin is suddenly depressurized, crew members can use oxygen immediately and prevent suffering from oxygen lack. A sudden increase in cabin altitude should not be harmful unless flying above 30,000 feet, in which case, some crew members might experience a temporary painful reaction from the "bends."

If power is set for long range or maximum endurance cruising, it may be necessary to run the inboard engines at 200 RPM higher than the outboard engines, to provide the additional boost necessary to supercharge the cabin. In this case, transfer fuel to inboard engines since they will be using more fuel. Set outboard engines at RPM which will maintain proper airspeed.

When pressurizing at high altitudes, open cabin air valves slowly, adjusting these valves to a 1000 foot per minute rate of descent. Differential pressure may sometimes seal up a leak, suddenly, during pressurizing procedure. This might push cabin rate of descent far beyond 1000 FPM. So while pressurizing, until cabin altitude is stabilized, watch cabin rate of descent closely and be prepared to adjust cabin air valves if rate of descent changes quickly.

DEPRESSURIZING PROCEDURE

The cabin may be pressurized by closing the Engineer's cabin air valves and opening the cabin pressure relief valve, if necessary. In emergencies, the cabin can be quickly depressurized by pulling either of two emergency cabin pressure release handles (Airplane Commander's control stand, and starboard side-wall of rear pressure compartment near forward bulkhead).

Always depressurize when ship is on fire or when preparing to abandon ship.

OXYGEN

The B-29 Demand Oxygen System is supplied by eighteen, type G-1, low-pressure, shatterproof oxygen filler valve, located on the outside of the fuselage just forward of the wing root on the left side.

Each of the 14 oxygen stations is supplied from two distinct distribution lines. Loss of one line or its associated cylinders still leaves each station with an alternate source of oxygen. The entire system is equalized by the use of crossfeeds controlled by automatic check valves. In the event of partial destruction of the system, all stations still functioning have equal access to the remaining oxygen supply.

Each oxygen station consists of the following equipment--A-14 demand mask, A-12 demand regulator, pressure gage, flow indicator, pressure warning light, low-pressure supply cylinders, and filler and distribution manifolding.

The length of time that the oxygen supply will last varies with the individual requirements of your crew, their activity, the temperature, and the equipment. However, with 400 to 425 lbs of pressure and the Automix ON, there is more than ten hours supply of oxygen for a crew of eleven men flying at 15,000 ft. The system is least economical at altitudes between 20,000 and 30,000 feet. Portable oxygen bottles are provided which may be refilled from the main oxygen system. These bottles last from five to eight minutes depending upon the activity of the user and the altitude. These bottles are not equipped with automatic mix features and give only pure oxygen upon demand.

When a crew member is suffering from oxygen lack, open the emergency valve on his regulator, but leave valve open only as long as necessary, as it will empty the system quickly. Leave auto-mix ON at all times to conserve the oxygen supply. Oxygen warning lights go on when system pressure drops below 100 lbs.

AIR CONDITIONING PROCEDURE

Two 3-position, toggle switches, to the left of the Engineer's panel, control position of the aftercooler flaps, thereby heating or cooling the cabin. To air condition the cabin, air valves must be open to furnish air flow, but cabin need not be sealed or pressurized. With toggle switches set at "closed", aftercooler flaps are closed to provide maximum cabin heat. With switches set "open", aftercooler flaps are full open to provide maximum cooling. With switches on "automatic", aftercooler flaps are set by thermostat control to maintain cabin air temperature of 70° F. New production airplanes do not have the "automatic" thermostat control.

FORMATION

For latest formation data see 21st Bomber Command Tactical Doctrine.

WEATHER FLYING

Thunderstorms

The first rule in flying weather is "STAY OUT OF THUNDERSTORMS". If it is impossible to avoid flying through a line of thunderstorm, enter it at right angles to shorten the period of time in it and follow these procedures:

a. Pitot heater on.
b. Set intercoolers to maintain CAT 25° to 38° C to prevent carburetor ice.
c. Set propellers at 2300--mixtures auto-rich, so you can "jockey" throttles through a greater range without exceeding engine limitations.
d. Maintain a constant airspeed of between 180 and 190 MPH indicated.
e. Turn all cockpit lights up to maximum brilliancy to prevent being blinded by an electrical

discharge. In connection with this, it is a good idea for the man not actually flying to shield his eyes with his hands. This is just an added precaution in case the man flying is temporarily blinded by a bolt of lightning.

f. Keep the wings level, the airspeed constant, and ride with the up and down drafts

Precipitation Static

When flying through a precipitation static area not associated with thunderstorms, the static in the radio and the chances of a static discharge may be minimized by doing the following:

a. Slow down your airplane 20 to 25 MPH.
b. Decrease RPM of propellers as much as possible (probably 200 to 300 RPM decreases will be possible depending on gross weight)
c. Climb or descend two or three thousand feet, depending on the type of weather and the terrain. This change of altitude and resultant change in temperature will often get you out of the static area.

Ice

To eliminate carburetor ice, indicated by engine roughness, a drop in manifold pressure, and carburetor air temperatures below 25° C, increase power to 2400 RPM and 43.5 inches and close the intercoolers (four toggle switches on Engineer's Stand). This will eliminate carburetor ice. If necessary to fly in carburetor icing conditions, establish the desired power for climbing or cruising, then maintain carburetor air temperature between 25° and 38° C by closing intercoolers, increasing turbo boost and throttling back.

To prevent or eliminate pitot tube ice, turn pitot heat on (toggle switch on Engineer's control stand).

To prevent or eliminate propeller ice, turn on anti-icer pumps (toggle switch on Engineer's control stand). Pumps are located under floor of rear pressurized compartment--one for inboard engines and one for outboard engines. Under Engineer's control stand are two separate rheostats for controlling flow of anti-icer fluid.

To eliminate wing ice, use de-icer toggle switch (Engineer's control stand) as necessary.

INSTRUMENT APPROACH

An instrument approach in the B-29 differs little from an instrument approach in other airplanes. Just remember these points.

a. When making an instrument approach and heading inbound toward the cone, set half flaps, 2400, and turbos on No. "8". Lower gear just short of cone.

b. Because the airplane is relatively unstable with flaps down, it is recommended that 25° flaps be set when starting to let down toward the cone, before beam bracketing becomes difficult and before changes in altitude become critical. It is also recommended that full flaps be saved until after you have broken through and are lined up with the runway on final approach.

c. When making an instrument take-off, the attitude of the airplane is very important. If the ship is held in the proper attitude for take-off, and immediately after take-off, airspeed will build up steadily. Don't pull the nose too high on take-off. Climb at a minimum airspeed of 160 MPH to 500 ft. above the terrain. Then, before continuing the climb, level off until reaching climbing airspeed (195 to 205, depending on weight), and until all CHT fall below 248° C.

d. Recommended instrument flying speeds:

T.O.	115-130 IAS
Climb	195 IAS
Let down (25° flaps)	150 IAS (Minimum)

this maneuver.

b. Squadron.

(1) The squadron leader will assemble his element, and will then fly straight ahead for three minutes. He will then turn 45° to the right, hold this heading for one minute, then turn 90° to the left, hold this heading for one minute, and then return to the original heading. Element leaders will join him during this maneuver.

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d. Recommended instrument flying speeds:

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Climb	195 IAS
Let down (25° flaps)	150 IAS (Minimum)

TROUBLE SHOOTING

IF WARNING HORN BLOWS

1. Check the wing flaps--horn (on cabin wall aft of Airplane Commander) blows steadily with gear down, flaps down less than 20° or more than 30°, and throttles more than 3/4 open.

2. Check cowl flaps--horn blows steadily with gear down, cowl flaps open more than 15° and throttles more than 3/4 open. Long red line on cowl flap indicator marks 15°; short red line marks $7\frac{1}{2}$°.

3. Check cabin pressure--horns (aft of Airplane Commander, in rear pressurized compartment, and in Tail Gunner's compartment) blow intermittently with cabin altitude above 12,000 feet. This warning may be turned off by switch on Engineer's auxiliary switch panel.

If these checks do not disclose the trouble, circuit is probably shorted, so pull the cabin warning fuse in Engineer's forward fuse panel.

CAUTION: Removing the 10 amp cabin warning fuse breaks circuit to red "unsafe to land" gear warning light and de-energizes the warning horn relay. Removal of 5 amp fuse in Airplane Commander's aisle stand breaks the power supply to the warning horn and the green "safe to land" gear warning lights. If it is necessary to pull this latter fuse to stop horn, fuse must be replaced momentarily after the gear is lowered to check and see if green lights are on.

FAILURE OF LANDING GEAR TO EXTEND OR RETRACT (See Emergency Procedures.)

GAS FUMES IN CABIN

1. Open windows and doors to prevent accumulation of fumes. Order crew members not to smoke.

2. Check the forward bomb bay for leaks around the fuel transfer system.

3. Check the "blue-white" lines to the Airplane Commander's and Flight Engineer's manifold pressure gages. These are direct reading instruments. Loose connections in the lines will release fumes in the cabin.

4. Check with the Tail Gunner for strong fumes

around the put-put.

5. Check bomb bay vents for syphoning.

6. In some cases, it may be advisable for crew to put on oxygen masks.

DETONATION

Detonation is an explosion of the mixture within the cylinder in contrast with the normal fast burning of the mixture. Detonation exerts excessive pressure within the cylinder, because all the mixture burns at once, instead of burning over a period of time.

Detonation can be identified by high cylinder head temperatures, rough engine operation, and puffs of black smoke issuing from the exhaust. Detonation is a function of high temperatures and pressures, being more pronounced and destructive as these factors increase. Therefore, detonation can be caused by (1) a climb or maneuver which tends to cut down the cooling air flow and raise head temperatures; (2) increasing carburetor air temperatures in attempting to avoid icing conditions; (3) increase in power causing increases in cylinder pressures and temperatures; (4) closing cowl flaps; or (5) lean fuel-air mixtures increasing combustion temperatures.

Proper correlation between RPM and manifold pressure is also necessary to prevent excessive brake mean effective pressures which cause detonation. Poor spark plug operation will cause preignition and detonation at high power settings. Use fuel of correct octane rating to prevent detonation. If detonation should occur, richen the mixture, lower the manifold pressure, and lower cylinder head temperatures by opening cowl flaps or increasing airspeed.

ELECTRICAL EQUIPMENT FAILURE

1. First check generators and inverters to make sure the system is not going dead. For example, fluorescent lights going out or interphone going dead may be the first indication that generator switches are off or that put-put is not "on the line."

2. Then check the fuse, or the circuit breaker reset button. For examples given above, find interphone fuse in radio compass relay shield forward of Radio Op-

erator and interior lighting fuse in Engineer's forward panel. See following pages for fuse location diagrams. Fuel transfer pumps, propeller governor circuits, inverters, and gun turret amplidynes are equipped with circuit breaker reset switches.

3. If electrical trouble such as burning of wires becomes apparent, turn all generators and battery switches off until trouble is found.

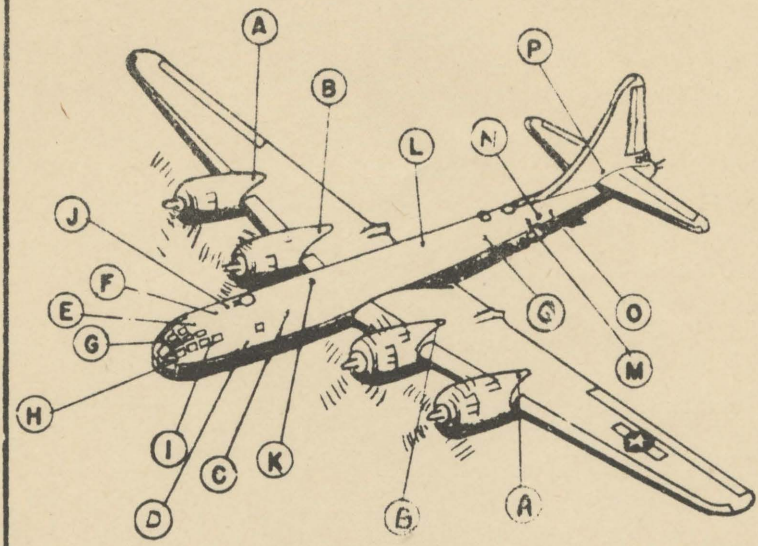
EMERGENCY LANDING GEAR SOLENOIDS

To operate the emergency landing gear solenoids, proceed as follows:

1. Remove the two screws and phenolic cover on down solenoid.
2. Press the solenoid bar firmly with hammer handle or screw driver for ten seconds (check and see if gear lowers) if so, repeat operation.
3. If results are not obtained:
   a. Repeat above operations on adjoining solenoid.
4. If results are not obtained:
   a. Place Pilot's transfer switch in normal position.
   b. Stop auxiliary power plant.
   c. Tighten all electrical connections in right or left (as applicable) emergency solenoid boxes located at station 485.
   d. Place Airplane Commander's transfer switch in emergency position.
5. Start aux. p.p.;have bus selector switch in emergency.
6. Repeat in order above steps 2 and 3.

RPM CHANGES

After changing RPM, make sure switches (Airplane Commander's aisle stand) are back in neutral position. Special caution in this regard should be taken on first power reduction after take-off. A suggested method for preventing a propeller switch from sticking is to grasp both metal tabs when changing RPM. If both tabs are used and switches are manually returned to neutral, rather than relying on the spring tension of the switch itself, there will be no danger of a propeller switch sticking.



B-29

LOCATION OF FUSE PANELS

(SEE NEXT PAGES FOR DETAIL)

LOCATION OF FUSES: (See Diagram previous page)

A. Outboard, Nacelle Solenoid Panel
   1. Cowl flap 50A
   2. Landing light 30A
   3. Generator 400 A (Current limiter)
   4. Generator 400 A (Current limiter)

B. Inboard, Nacelle Solenoid Panel
   1. Landing gear door 150A
   2. Cowl flap 50 A
   3. Generator 400 A (Current limiter)

C. Inverter Relay Shield
   1. 2 inverter circuit breakers, with reset buttons
   2. API 2A
   3. API 1A
   4. TBS 2A
   5. #1 Amplifier 2A
   6. #2 Amplifier 2A
   7. #3 Amplifier 2A
   8. #4 Amplifier 2A

D. Turret Junction Shield
   1. API 10A
   2. Interior lights 10A
   3. Compass caging motor 3A
   4. Flight control 30A
   5. Suit heater 35A
   6. Lorenz Equipment 10A (open)
   7. Forward bomb door safety switch 2A
   8. ANRR-1-1A-3AC
   9. Circuit Breaker SCR 522 with reset button

E. Engineer's Forward Fuse Panel
   1. Surface de-icer 5A
   2. Engine primer 10A
   3. Fuel shut-off 15A
   4. Fuel shut-off 15A
   5. Cowl flap 2A
   6. Cowl flap 2A
   7. Cabin warning 10A
   8. Oil dilution 10A
   9. DC instr. 10A
   10. Inverter relay 10A
   11. Interior lights 15A
   12. Hydraulic pump and oxygen warning 2A

F. Engineer's Aft Fuse Panel
   1. Cabin heat R.H. 15A

2. Cabin heat L.H. 15A
3. Starter 20A
4. Fuel boost No. 4 20A
5. Fuel boost No. 3 20A
6. Fuel boost No. 2 20A
7. Fuel boost No. 1 20A
8. Intercooler No. 4 15A
9. Intercooler No. 3 15A
10. Pilot heater 15A
11. Pilot's suit htr. 20A
12. Engineer's suit htr. 20A
13. Radio Operator's suit htr. 20A
14. Hyd. pump 2A
15. Oil cooler No. 1 15A
16. Oil cooler No. 2 15A
17. Oil cooler No. 3 15A
18. Oil cooler No. 4 15A
19. Anti-icer 5A
20. Intercooler No. 1 15A
21. Intercooler No. 2 15A
22. Pilot heater 15A

G. Aisle Stand Fuse Panel
1. Extension light 2A
2. AFCE heater 15A
3. Landing gear warning horn 5A
4. Position lights 20A
5. Bombardier's suit heater 20A
6. Prop feathering (open)
7. Landing lights 5A
8. Emergency alarm 5A
9. Formation lights 2A
10. Landing gear 10A
11. Flap motor 5A

H. Bombardier's Fuse Panel
1. Bomb sight 15A
2. Camera 2A
3. Bomb door 2A

I. Nose Wheel Well Panel
1. Nose gear motor 150A (or 200A)

J. Radio Compass Relay Shield
1. Interphone 15A
2. 535/595 receiver 20A
3. Radio compass relay (AC) 3A
4. Radio compass relay (DC) 10A
5. Ant. reel relay 2A

K. Forward Bomb Door Solenoid Shield
   1. Antenna reel 10A
L. Aft Bomb Door Solenoid Shield
   None
M. Computer Voltage Regulator
   1. 5 fuses each 5A
N. Junction Shield 2091 (under Radar Oper. table)
   1. DC Fuses
      a. Bomb 10A
      b. Light 5A
      c. Fan 10A
      d. Turret 10A
      e. Heater 15A
      f. Heater 30A
      g. Heater 30A
      h. Raven 10A
      i. Supply to Raven junction box 10A
   2. AC Fuses
      a. Raven 15A
      b. 622 5A
      c. 7-18 (218) 5A
O. Battery Solenoid Shield
   1. Battery solenoid and IFF detonator 20A
   2. Interior light 5A
   3. Camera 35A
   4. Auxiliary power plant ignition switch 5A
   5. Auxiliary power plant circuit breaker 300A
P. Tail Skid Junction shield
   1. Tail skid motor 20A
   2. Amm. booster L.H. 30A
   3. Amm. booster R.H. 30A
   4. Warning horn 5A
   5. Suit heater 20A
   6. Warning light 2A (open)
Q. Station 646 Fuse Panel
   1. 50A (open)
   2. Suit heater 35A
   3. Defroster 20A
   4. Defroster 35A
   5. Warning Horn 5A
   6. Oxygen warning 5A (open)
   7. Interior lighting 5A
   8. Interior lighting 5A

WING HEAVINESS

1. Check trim tab position indicator.
2. Check for equal fuel quantity in left and right wings.
3. Check wing flap retracting linkage for identical wing flap positions.

SYSTEMS

FUEL SYSTEM

Fuel is transferred by two electric pumps, controlled by toggle switches on Engineers stand. Hourly capacity at sea level, with both pumps operating, is 1500 gallons per hour; at 30,000 feet it is 500 gallons per hour. System may be operated with either of the two pumps, which would cut the above capacity figures to 800 GPH at sea level and 300 GPH at 30,000 feet.

Fuel is carried in four wing tanks (capacity of each inboard tank 1436.5 gallons, of each outboard tank 1367.5 gallons), and seven auxiliary tanks. Each of the four bomb bay tanks holds 640 gallons; the wing center section tank holds 1315 gallons in the B-29 and B-29B 1120 in the B-29A. Various combinations of auxiliary tanks may be used.

Fuel may be transferred between rear bomb bay tanks and front bomb bay tanks; between rear bomb bay tanks and tank 3 or 4; between front tanks and tank one or two; and across center line of airplane from engines 1 or 2 to either 3 or 4. Fuel may be transferred between wing center section tank and any other tank, as each tank selector quadrant has position marked "wing center section tank."

Wing tanks are vented through lines to openings on either side of fuselage. Bomb bay tanks are vented beneath the fuselage.

Tank safety switches, high on the port wall of each bomb bay, should be turned off when bomb bay tanks are installed. This disconnects the bomb release mechanism and prevents unintentional release of bomb bay tanks.

Engine primers, operated by momentary contact switches on Engineer's control stand, inject fuel into the blower section.

Fuel boost pumps are operated by rheostats on Engineer's control stand. Later models incorporate the off-on switch in the rheostat, instead of using separate toggle switches.

OIL SYSTEM

The capacity of each engine oil tank is 80 gallons.

A 100-gallon reserve oil tank is located on the port side of the center wing section near the oil transfer pump and the oil transfer selector valve. The oil dilution line from the fuel system enters the oil system at the top of the "Y" drain, before oil reaches pump.

If emergency take-off is necessary, before engine oil is warm, oil should be diluted.

Engine oil temperature is regulated by an automatic oil cooler shutter control. A manual override switch on the Engineer's control stand can be used if necessary, to set the oil cooler shutter manually. Don't use feathering button to change oil in prop dome.

LANDING GEAR

Landing gear may be lowered at airspeeds below 180 MPH. Nine electric motors operate the system--two normal motors for the main gear, two emergency motors for the main gear, two motors for the main gear doors (on the emergency system, main gear doors are released so that they fall of their own weight), one normal nose gear motor and one emergency nose gear motor (nose gear doors and nose gear are operated together with the same motor by a mechanical linkage) and tail skid motor.

Normal landing gear switch, main gear door motors, and normal nose gear motor are fused (nose gear fuse in nose wheel well). If main gear extends and locks, but nose wheel does not, check nose gear motor fuse.

Landing gear operation takes 40 seconds on normal system, not less than 1½ minutes on emergency system.

Main landing gear doors, after being released on emergency system, cannot be raised except by using the normal system in the following manner:

a. Return landing gear transfer switch and bus selector switch to normal.
b. Return emergency landing gear switches to "neutral".
c. Put normal gear switch down until both main gear start down. This engages the retracting mechanism to the doors.
d. Return switch to "neutral," wait 30 seconds, then switch to "Up." Gear and doors should retract.

RADIO EQUIPMENT

The B-29 is equipped with the following radio sets:
Command Set — SCR 274 — Controlled by Airplane Commander
Radio Compass — SCR 269 — Controlled by Pilot and Radio Operator
IFF — SCR 695 — Controlled by Airplane Commander and Radar Operator
VHF — SCR 522 — Controlled by Airplane Commander and Pilot
ATC Set — AN/ART-13 — Controlled by Radio Operator
Gibson Girl Set — For emergency use by crew
Interphone Set — RC-36B
Blind Landing — RC-103 — for Airplane Commander's use
Marker Beacon — RC-43 — for use with radio compass

Eleven jackboxes (for Bombardier, Airplane Commander, Pilot, Engineer, Navigator, Radio Operator, Top Gunner, Side Gunners, Tail Gunner, and Relief Gunner) have five positions: COMP, VHF FOR ALL CREW MEMBERS EXCEPT RADIO OPERATOR WHO HAS LIAISON, COMMAND, INTER AND CALL.

In an emergency, Airplane Commander can communicate with the crew by emergency interphone (transmitter selector switch on 3 or 4 and jackbox on "Command"), by alarm bell, by phone call signal light switch (on Airplane Commander's aisle stand), and by "call" position on jackbox.

ELECTRICAL SYSTEM

Electrical power is supplied by 6 engine-driven, 28-volt, 300-ampere generators, (2 on outboards, 1 on inboards), a 24-volt, 34-ampere hour battery, a 28-volt, 200-ampere auxiliary generator, and two 750-volt ampere inverters. Engine Driven generators (switches on Engineer's control stand), will cut in at 1100 RPM and reach maximum output at 1375 RPM. Either inverter may be used to supply 26 volt alternating current for the autosyn instrument (flap position indicator), and 115 volt AC for the radio compass, the flux gate compass,

and the turbo regulators. AFCE operates on 115 volt AC from its own inverter.

The put-put uses 100 octane gas and SAE No. 30 oil. As this auxiliary generator is not supercharged, its voltage output will decrease above 10,000 feet. At very high altitudes, the put-put will run only if the mixture is leaned out.

After turning the ignition switch on and setting the throttle to "Idle" (unless control is automatic), start the put-put either with the hand-cranking rope or by putting the generator switch on "start" (if battery switch is "on"). As soon as put-put is started, set generator switch to "off". When manifold feels warm to the touch (3 to 5 minutes), set throttle to "run" (unless control is automatic), set generator switch to "run", and turn equalizer switch on.

Leaving equalizer switch on when engine-driven generators are not "on the line" robs the system of about half of a volt, but it is better to take the loss and be sure of having the equalizer switch on when it is needed.

To stop the put-put, set throttle at idle, turn generator equalizer and ignition switches off.

The external power plug is located in the nose wheel well.

Power from the engine-driven generators is directed to the emergency bus by the landing gear transfer switch (Airplane Commander's control stand). Power from the put-put and battery is directed to the emergency bus by the bus selector switch (battery solenoid shield). When using bus selector switch, put-put should be "on the line."

The emergency bus, when actuated, supplies power only to the emergency landing gear motors and the portable electric motor.

The 24-volt, DC system operates four fuel boost pumps, two anti-icer pumps (one for inboards, another for outboards), four feathering pumps, and two fuel transfer pumps.

The B-29 has the conventional system of position lights, recognition lights, and formation lights. Also included are landing lights which turn on when extended from the underside of wing. (Don't extend landing lights above 180 MPH indicated). Wheel well spotlights, controlled from Engineer's stand, illuminate the landing

gear for a visual check at night.

TABLE OF AMPERAGE LOADS

Upper forward turret	132.5	(Battle load 275.5)
Upper aft turret	132.5	(Battle load 275.5)
Lower forward turret	84	
Lower aft turret	84	
Tail turret	242	(Battle load 420)
Tail ammunition booster motors (2)	40	
C-1 auto pilot	6	
Bomb doors (forward and aft)	480	
Landing gear (2)	460	
Nose gear	155	
Wheel doors (2)	280	
Wing flaps	200	(350 in flight
Hydraulic pump	110	
Landing lights (2)	52	
ATC radio set	35	

POWER PLANT

The B-29 is powered by R-3350, Wright, 18-cylinder, radial engines. Hamilton Full-Feathering Propellers rotate clockwise, when viewed from the rear, on a shaft reduction ratio of .35. Propeller governors are controlled electrically by four, two-position toggle switches on the Airplane Commander's aisle stand. The Prop Governor system uses circuit breakers instead of fuses, with reset buttons at the aft end of the Airplane Commander's stand. Also on the Airplane Commander's aisle stand are four feathering buttons. Prop feathering circuits are not fused, but are equipped with circuit breakers on later models.

CAUTION: To increase life of engines, Airplane Commander should not check magnetos in flight, or operate engines at higher powers than necessary for long range cruising airspeeds.

The carburetor is a Chandler-Evans automatic, type 58-C PB-4.

The engine is started by a Jack and Heintz combination inertia and direct cranking starter.

Vacuum pumps, one for each engine, provide vacuum for the cameras, de-icer boots and instruments; and

provide pressure for inflating the de-icer boots. Either inboard vacuum pump may be used for vacuum (selector lever on Engineer's control stand). The other three pumps provide pressure for the de-icer boots.

Operating Condition	Horse-power	RPM	Manifold Pressure	Mix	Fuel Flow GPH per Eng.	Max. CHT
Take-Off* (5 Min.)	2200	2800 2600	49 47.5	Auto Rich	290	260
Rtd Power (Climb)	2000	2400	43.5	Auto Rich	250	248
Rtd Power (Level-con)	2000	2400	43.5	Auto Rich	250	248
Cruise	1750	2300	39	Auto Rich	200	248
Cruise	1450	2200	35	Auto Rich	160	240
Cruise	1170	2100	31	Auto Lean	110	232
Long Range Cruising	950	2000	28 ± 2	Auto Lean	95	232
	850	1800	28 ± 2	Auto Lean	81	232
	600	1400	28 ± 2	Auto Lean	62	232

*Military Power at 25,000 ft.

For information on fuel consumption, power settings, maximum range, etc., see cruise control section of "Standard Procedures for Flight Engineers".

HYDRAULIC SYSTEM

Electric hydraulic pump cuts in when main hydraulic pressure falls below 800 PSI, and cuts out when main hydraulic pressure reaches 1,000 PSI. If main pressure drops below 600 PSI, Co-pilot's amber warning light goes on. Hydraulic pump will run continuously at pressures below 800 PSI, unless pressure falls below 200 PSI, when pump will cut out to prevent overheating in case hydraulic fluid is lost.

When emergency pressure falls below 900 PSI, amber warning light on Engineer's panel will burn. To service, switch hydraulic servicing valve (on Engineer's panel) to "open", press momentary contact toggle switch (on Engineer's stand) until pressure builds up to 1075 PSI. Momentary contact switch will operate pump, regardless of pressure in either system. Pressure relief valve opens at 1075 PSI and reaches full open position at 1200 PSI.

Capacity of hydraulic tank is three gallons, plus a half gallon expansion space.

NOTE: Tank gage should read approximately 2 gallons when parking brakes are set.

The hydraulic panel, located at the rear of the forward pressurized compartment under the floor, contains an electric pump, a floating piston-type accumulator, a filter, a pressure switch, a relief valve, and a shut-off valve. Hydraulic hand pump (left of co-pilot) may be used in event of electric pump failure.

Parking brakes should not be set if brakes are hot, as the brakes will not cool properly with parking brakes on.

Air pressure preload in both normal and emergency accumulators is 400 PSI.

TURBOSUPERCHARGER SYSTEM

General Electric Type B-11, exhaust driven, turbosuperchargers provide compressed air for the carburetor. A Honeywell Electronic turbo regulator system is used for control of boost and is regulated by a master control located on Airplane Commander's aisle stand.

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MISCELLANEOUS DATA

NORMAL INSTRUMENT READINGS

	Min	Desired	Max.
Nose Oil Pressure	20	30-50	55 PSI
Rear Oil Pressure	60	70-80	85 "
Oil Temperature	40	50-90	95 "
Fuel Pressure	16	17-18	20 "
De-icer Pressure		7-7.5	PSI
Vacuum Pressure		3.8-4.2	In Hg
Oxygen Pressure		400-425 (Cold)	450 PSI
Hydraulic Pressure (Normal & Emergency)		800-1000 PSI	

STRUCTURE

Wing Span	141'
Length	98'
Height	29'
Wing Design	Boeing 117

Compartments from nose to tail are:

Forward pressure cabin, forward bomb bay, fuselage wing gap, aft bomb bay, rear pressurized compartment, rear unpressurized compartment, Tail Gunner's compartment. Front and rear pressurized compartments are accessible when cabin is pressurized; others are not accessible.

Controls are conventional. Aileron and rudder trim tabs also function as servo tabs to make control movement easier.

Wing flaps (Fowler design) may be lowered to 25° at indicated airspeeds below 220 MPH, to 45° at indicated airspeeds below 180 MPH.

PROCEDURE FOR OPERATING FUEL INJECTION ENGINES:

Bendix - Starting.

1. Master ignition switch - ON.
2. Set throttles at 800 to 1000 RPM.
3. Fire extinguishers - Set selector to engine being started.
4. Move mixture control to Auto Rich.
5. Fuel boost to low (9-12 PSI)
6. Energize starter 12 to 16 seconds.
7. Mesh starter.
8. When prop has turned one revolution, turn ignition switch ON.
9. Fuel boost OFF after engine is operating smoothly.

WARNING: If this procedure does not start engine after thirty (30) seconds of meshing, let starter cool for one minute, then repeat procedure.

Bendix - Stopping.

Stopping instructions are the same as for carburetor engines.

Bosch - Starting.

1. Master ignition switch - ON.
2. Move throttle through two cycles of travel (in order to set positioning pump), then set throttle to full open position.
3. Fire extinguishers - Set selector to engine being started.
4. Move mixture control to Auto Rich.
5. Fuel boost to low (9-12 PSI).
6. Energize starter 12 to 16 seconds.
7. Mesh starter.
8. When propeller is turned one revolution, close throttle to equivalent 1000 RPM position and turn ignition switch ON.
9. Fuel boost OFF after engine is operating smoothly.

Bosch - Stopping.

Same as for carburetor engines. (Closing throttle eliminates possibility of running Bosch fuel pump dry.)

MANIFOLD PRESSURE SURGE AT HIGH ALTITUDE

To eliminate manifold pressure surges at high altitude, the following procedure should be used:

1. Advance r.p.m. and manifold pressure on outboard engines (keeping power settings related) until throttles are full open or until surge is eliminated.

Reduce manifold pressure and r.p.m. on inboard engines to balance power for best maximum range cruising airspeed or until it is impossible to maintain cabin pressurization.

2. In the event Step 1 does not eliminate surges in manifold pressure, advance r.p.m. (approximately 50 to 100 r.p.m.) on affected engines until surge is eliminated. A balanced power condition between opposite sides of airplane must be maintained.

CAUTION: Step 2 will give unrelated power settings which are undesirable. Related power settings must be restored as soon as possible to insure economy in fuel consumption.

OXYGEN DRILL

Oxygen drill will consist of the following:

1. Airplane Commander will give order "Stand by for oxygen drill," at which time each crew member will strap his mask into place within a minimum time, checking immediately to ascertain whether he is receiving proper oxygen supply.

2. Upon completion of step 2, each crew member will notify pilot in following order that he is OK and on oxygen: Tail Gunner, Radar Operator, Top Gunner, Left Gunner, Right Gunner, Radio Operator, Navigator, Engineer and Bombardier.

3. Crew will wear masks until told to remove them by Airplane Commander. Pilot will check the crew members on the interphone every 15 minutes while at altitude when the ship is depressurized and oxygen masks are being used.

NOTE: When at altitude, each crew member will at all times have his oxygen mask plugged into outlet, with regulator set at auto-mix.