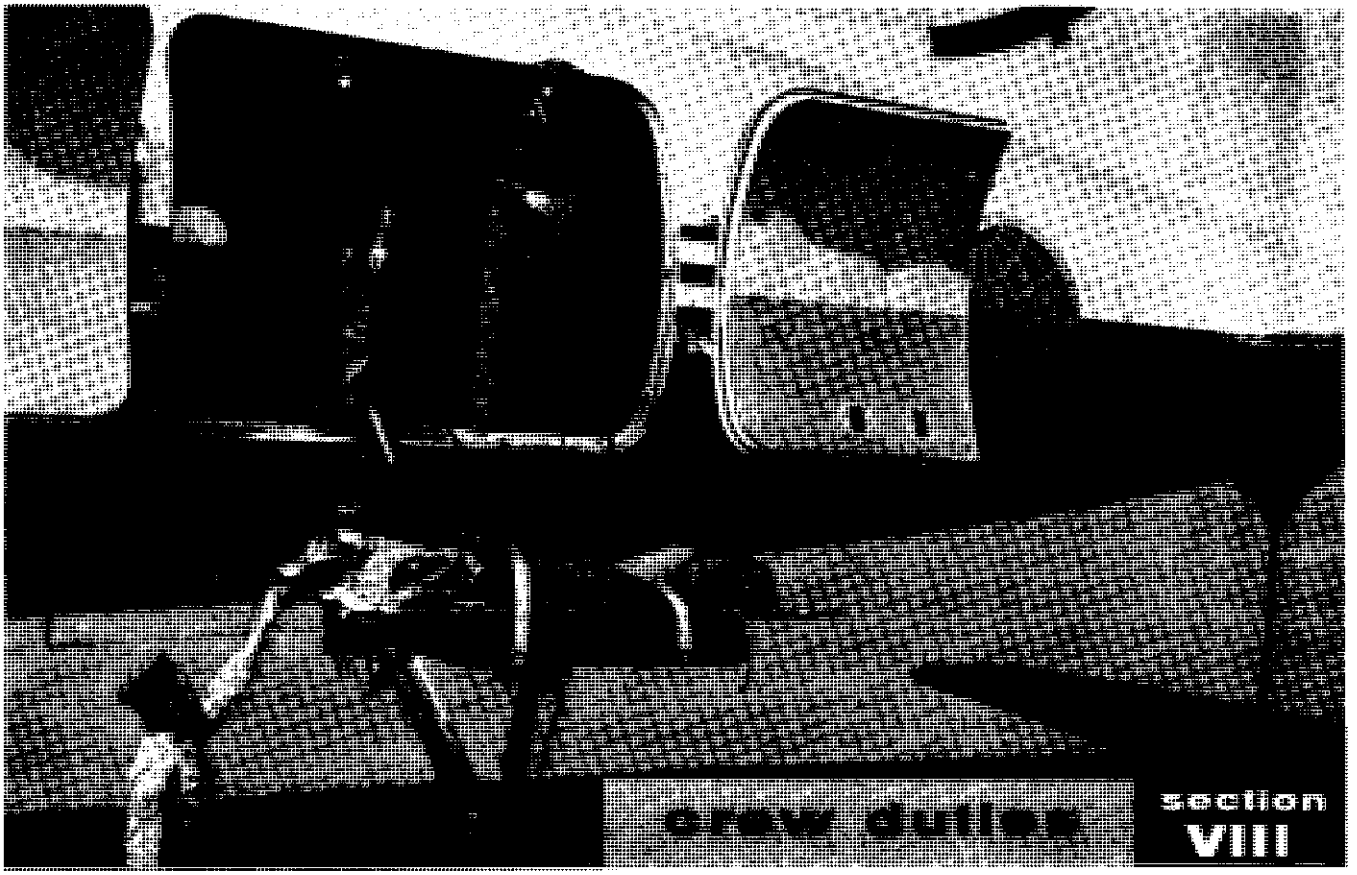

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INTRODUCTION.

This section lists the responsibilities, other than primary functions, of crew members.

PILOT.

It will be the responsibility of the pilot to insure that a thorough inspection of the aircraft and all equipment is properly conducted. The inspection checklists are covered in detail in Sections II and III.

COPILOT.

The copilot will aid the pilot, as directed, in order to accomplish the assigned mission.

CREW ENGINEER (WHEN ASSIGNED).

The crew engineer will perform a complete preflight inspection prior to departure and will determine whether the condition of the aircraft is satisfactory for the mission. The crew engineer will in turn report the condition of the aircraft to the pilot. The checklists for the crew engineer are covered in detail in Sections II and III.

RADIO OPERATOR (WHEN ASSIGNED).

The radio operator, in addition to making an equipment checkout as described in Section IV, will also:

1. Report condition of equipment to the pilot.
2. Have a thorough knowledge of emergency equipment.
3. Inspect the emergency radios for correct stowage and current inspection dates.

RADIO OPERATOR'S INSPECTION.

Exterior Preflight.

1. All the antennas — Checked for the following:
   a. Proper installation.
   b. Cracked insulators.
   c. Cleanliness.
   d. Proper tension.
2. Compass loop housing — Checked for leaks.

Interior Preflight (Power Off).

1. AFTO Form 781 — Check for status.
2. Radio G-file — Check for completeness and condition.
3. Radio facility charts and radio data charts — Installed and corrected to latest Airman's Guide.
4. Frequency charts for VHF/UHF and liaison — Check for correct frequencies VHF/UHF and liaison frequency charts; check for current frequency assignments and channelization.
5. Jack boxes and microphones — Check for condition of all wiring, and cleanliness and security of connector plugs.
6. ILS equipment — Check for proper mounting and security and that all connections are tight.
7. VHF/UHF transmitter, receiver, and junction box — Check for proper mounting and security. Make certain that all connections are tight. Check the junction box for active and spare fuses (replace all blown or missing fuses).
8. VHF/UHF crystals — Check for installation of proper crystals for assigned frequencies.
9. Liaison dynamotor and fuses — Check for proper mounting and security; check the active and spare fuses. Replace all blown or missing fuses.
10. Radio compass — Check for proper mounting and security.
11. Antenna lead-ins — Make certain that they are seated properly.
12. IFF destructor circuit breaker — Pushed in.

Interior Preflight (Power On).

Note

The operational check will be made when the engineer applies the power for his operational check.

1. VHF/UHF — Check for the following:
   a. Transmitter and receiver checked for proper operation.
   b. Check the tone button for proper operation on channel.

2. Radio compasses — Check for the following:
   a. Check the two control panels for proper alignment of low- and high-frequency band and control.
   b. Receivers — Check for operation on all bands and all selector positions.
   c. Indicators — Check for operation on loop and compass positions with local range station.
   d. Check all panel lights. Replace all defective lights.
   e. Check the LOOP C. W. switch for proper operation.
3. Omni-range — Operational check.
4. ILS equipment — Check for operation by the indication of the glide slope and localizer needles.
5. Liaison transmitter and receiver — Check for proper tuning on all channels of the transmitter; check for reception on all bands of the receivers, and check the transmitter and receiver with the tower for operation.

In Flight.

Turn the liaison sets on.

1. Make initial contact with control.
2. Set up the log in such a manner that events of the mission may be reconstructed.
3. Transmit and enter in the log the takeoff message, position reports, strike reports, landing reports, and any other messages or reports as directed.

Descent.

1. Station ..... Closed
2. Liaison set ..... OFF
3. Safety belt ..... Fastened

Postflight.

1. Log — Closed and signed; make final entries in the log and sign it.
2. Perform radio equipment postflight as required.
3. AFTO Form 781 — Make certain all discrepancies are entered in AFTO Form 781.
4. Logs, codes, and ciphers — Turn in to the proper authority all logs, codes, ciphers, and any other pertinent data.

NAVIGATOR (WHEN ASSIGNED).

The navigator will aid the pilot in all matters pertaining to flight planning and will perform any other assigned duties. He will also perform the following preflight inspection of navigational equipment and report the condition to the pilot.

NAVIGATOR'S INSPECTION.

Preflight (Power Off).

1. Driftmeter — Check glass for condition.
2. AFTO Form 781 — Check for any information pertaining to the aircraft navigational instruments.
3. Celestial tables and emergency map kits — Complete.
4. Loran antenna — Check for connections.
5. Radio altimeter antenna (if installed) — Check for proper installation, cracked insulations, and cleanliness.
6. Oxygen equipment — Check oxygen indicator and check mask fittings.
7. Astrocompass and mount — Check and align at all positions (if installed).
8. Altimeter setting at 29.92 inches Hg — Set.
9. Magnetic compass — Check for date of calibration.
10. Aircraft clocks — Set.

Preflight (Power On).

1. Circuit breakers — Check circuit breakers and fuses in main junction box.
2. Driftmeter — Check for reticule angle and alignment — CAGED and OFF.
3. Flux Gate compass or N-1 compass — Check for operation against magnetic compass.
4. Loran equipment — Check for calibration and loose connections.
5. Radar — Check operation (if installed).

6. Table and dome light – Check for operation (if installed).
7. Radio altimeter – Check for operation.

In Flight.

1. Ready all equipment for operation.

Descent.

1. Loran ..... OFF
2. Trailing antenna (if installed) ..... IN
3. Driftmeter ..... CAGED and OFF
4. Navigator's chart table ..... Stowed
5. Safety belt ..... Fastened

Postflight.

1. Radio compass ..... OFF
2. Log ..... Closed
3. Navigation equipment ..... Stowed
4. AFTO Form 781 ..... Completed
5. Lights ..... OFF
6. Debriefing ..... Completed

CONDENSED CHECKLISTS.

Pages 8-5 through 8-8 comprise the Condensed Checklists for the radio operator and navigator, and may be removed from the Manual for ready reference.

NAVIGATOR'S CONDENSED CHECKLIST — TYPICAL

PREFLIGHT (POWER OFF).

1. Driftmeter — Checked.
2. AFTO Form 781 — Checked.
3. Celestial tables and emergency map kits — Complete and aboard.
4. Loran antenna — Checked.
5. Radio altimeter antenna — Checked.
6. Oxygen equipment — Checked.
7. Astrocompass and mount — Checked and aligned.
8. Altimeter — Set.
9. Magnetic compass — Checked.
10. Clocks — Set.

PREFLIGHT (POWER ON).

1. Circuit breakers and fuses — Checked.
2. Driftmeter — Checked, CAGED and OFF.
3. Flux gate compass or N-1 compass — Checked for operation.
4. Loran equipment — Checked for calibration and loose connections.
5. Radar — Checked for operation.
6. Table and dome light — Checked for operation.
7. Radio altimeter — Checked for operation.

NAVIGATOR'S CONDENSED CHECKLIST – TYPICAL (Continued)

INFLIGHT CHECK.

1. All navigation equipment – Ready for operation.

DESCENT CHECK.

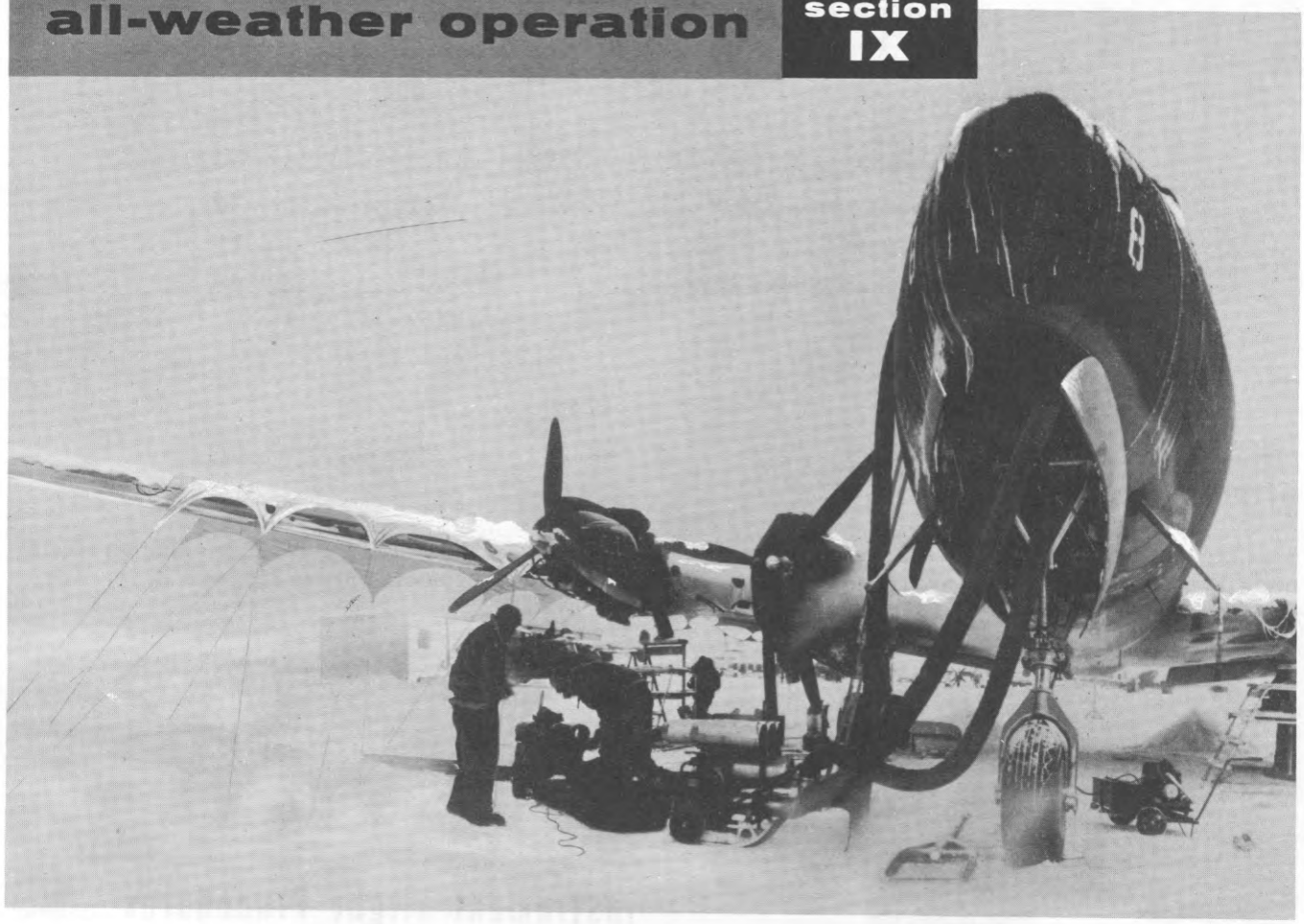
1. Loran – OFF.
2. Trailing antenna – IN.
3. Driftmeter – CAGED and OFF.
4. Chart table – Stowed.
5. Safety belt – Fastened.

POSTFLIGHT CHECK.

1. Radio compass – OFF.
2. Flight log – Closed and signed.
3. Navigation equipment – Stowed.
4. AFTO Form 781 – Completed.
5. Lights – OFF.
6. Debriefing – Completed.

all-weather operation

section IX



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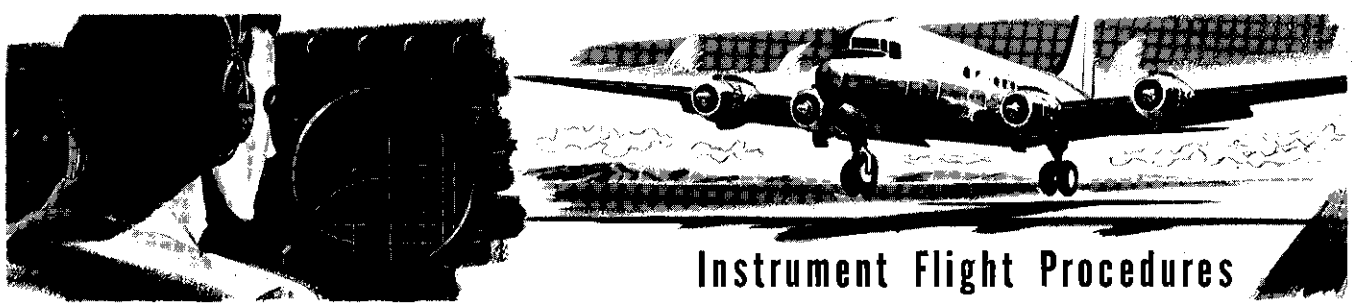
LIST OF ILLUSTRATIONS

INTRODUCTION.

This section contains exceptions or additions to the normal operating instructions covered in Section II, as well as repetitions necessary for emphasis, clarity, or continuity of thought. For detailed information regarding systems operation, refer to Section VII.



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The aircraft has excellent maneuverability characteristics for instrument flying. Stability in all axes is excellent. Before flight, check that all radios and flight instruments are operating properly.

INSTRUMENT TAKEOFF.

Planning for instrument takeoff should include possibility of return to the field, and suitable precautions should be taken including the monitoring of the takeoff by GCA or other instrument facilities. Use the normal takeoff procedure.

INSTRUMENT CLIMB.

Normal climbing turns should be limited to 30 degree bank angles.

CRUISING UNDER INSTRUMENT CONDITIONS.

The aircraft should be handled in the same manner as during VFR flight (see the Appendix for cruising speeds). In addition, the flight instruments should be checked periodically for proper operation.

Note

The rotating anticollison light may be turned OFF during flight through certain instrument conditions. With the light ON during instrument conditions, the pilot may experience vertigo as a result of the rotating reflections of the light against the clouds.

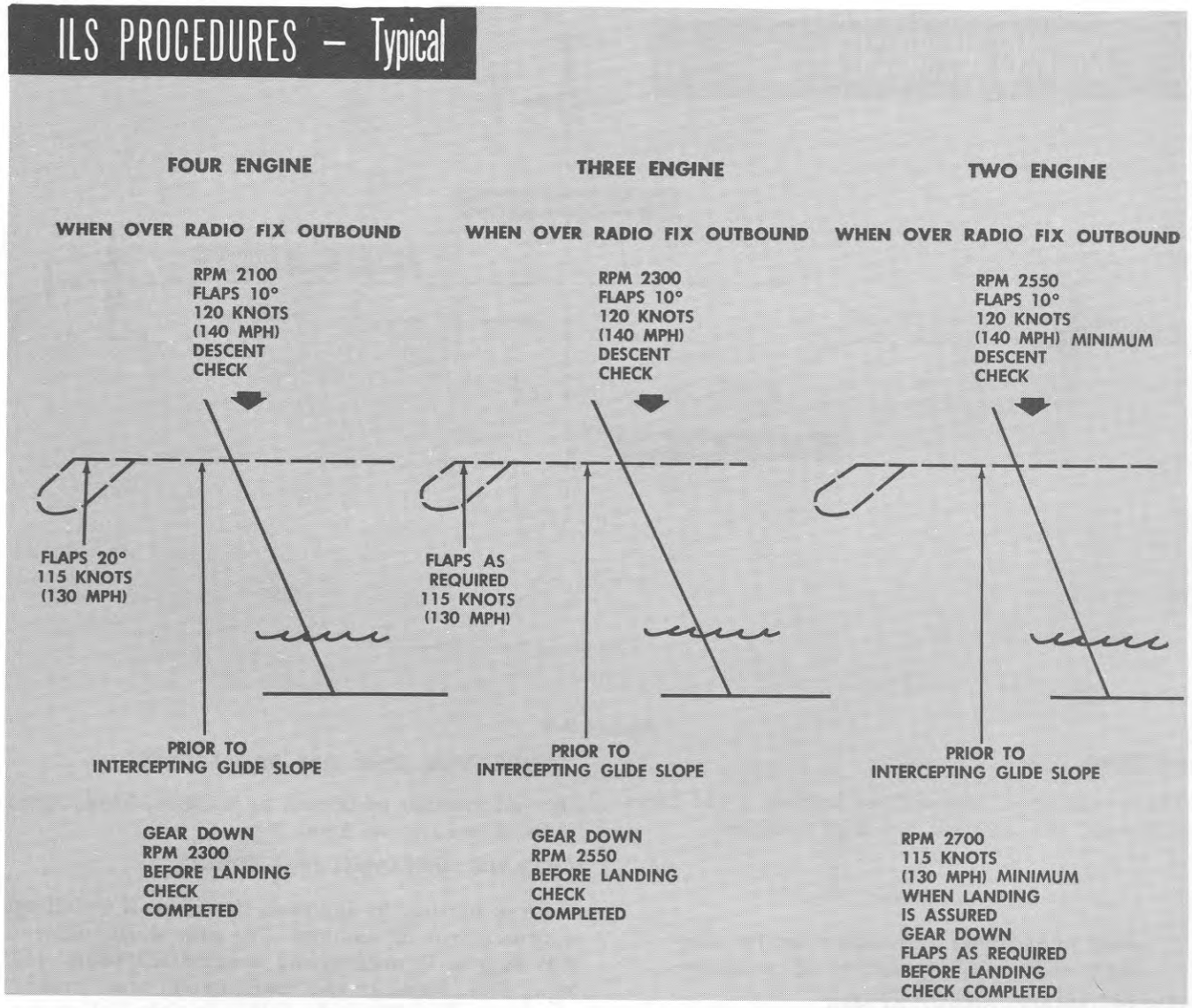
SPEED RANGE.

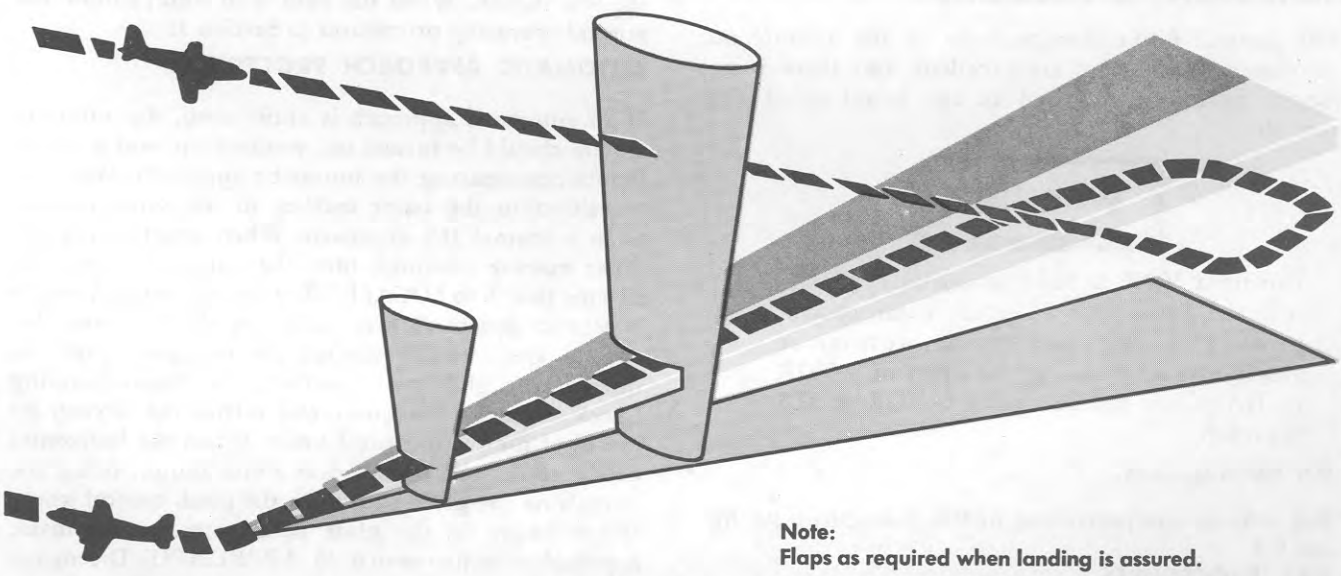
Stability and flight characteristics are good throughout the full range of speed, and instrument flight should be conducted in accordance with power charts (see the Appendix).

DESCENT.

To descend from altitude, use the same procedure as during VFR flight, down to the minimum safe altitude in accordance with instructions received from the airway traffic controller.

ILS PROCEDURES – Typical





Note:
Flaps as required when landing is assured.

Figure 9-1

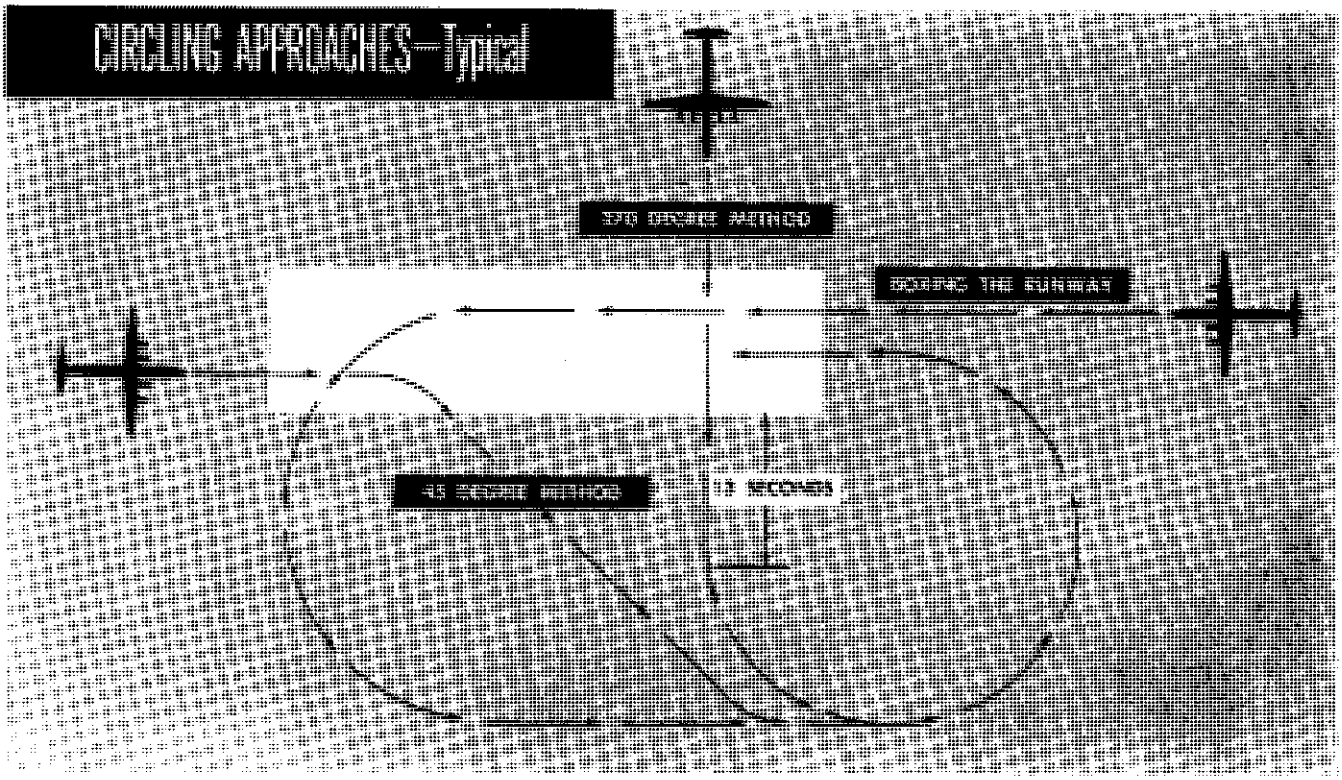


Figure 9-2

HOLDING.

The recommended airspeed for holding is 122 knots (140 mph) IAS, gear UP, and flaps 10 degrees.

Note

Refer to Appendix performance data for maximum endurance information (if necessary).

INSTRUMENT APPROACHES.

The general flight characteristics of the aircraft on instrument approaches are excellent, and there is no special technique required in the handling of the aircraft.

WARNING

During a VOR or ILS instrument approach, turn the Tacan set OFF at the Tacan control panel. This will prevent an automatic switch-over to Tacan in the event of a VOR or ILS power failure during a VOR or ILS approach.

ILS PROCEDURES.

For information pertaining to ILS procedures, see figure 9-1.

GCA PROCEDURES.

For information pertaining to GCA procedures, see figure 9-3.

RANGE, VOR, AND ADF PROCEDURES.

For information pertaining to RANGE, VOR, AND ADF procedures, see figure 9-4.

CIRCLING APPROACH PROCEDURES.

Prior to starting the approach, determine if a circling approach will he required. The gear should remain UP, flaps at 10 degrees, and airspeed 122 knots (140 mph) IAS. Maintain this configuration after passing the low station. When the field is in sight, follow the normal operating procedures in Section II.

AUTOMATIC APPROACH PROCEDURE.

If an automatic approach is anticipated, the autopilot system should he turned on, warmed up, and engaged before commencing the automatic approach. Make the transition to the outer marker in the same manner as in a normal ILS approach. When approaching the outer marker inbound, turn the automatic approach selector switch to LOCALIZER when the vertical needle hegins to deflect. When steady on the localizer, disengage the altitude control (if engaged) prior to intercepting glide path, perform the Before Landing Check at pilot's discretion, and retrim the aircraft by means of the pitch control knob. When the horizontal needle shows one to two dots above center, bring the aircraft on the glide path with the pitch control knob. When steady on the glide path, turn the automatic approach selector switch to APPROACH. Disengage the autopilot upon reaching prescribed automatic approach minimums. With the exception of the automatic approach feature, the approach should be made in

accordance with normal ILS procedures *(figure 9-1)*. See Section IV for operation of the automatic approach equipment.

ICING.

Before entering known or suspected icing conditions, turn on pitot heater and anti-icing equipment, and monitor during operation. Should icing become extreme, the clearview windows may be opened and the windshield scraped clear of ice.

CAUTION

If de-icer boots are used, do not operate them continuously, as this may result in ballooning the ice immediately over the boots and render them ineffective. Allow the ice to build up, then turn on de-icer boots to break it off. After the ice is removed, turn the system OFF until the ice builds up again.

Note

Climb or cruise at 10 to 15 knots above normal speeds when in icing conditions; reducing the angle of attack minimizes the accumulation of ice on the under surfaces.

WARNING

Stalling speeds increase proportionately to the amount of ice buildup on the wings. During approach or low altitude flights when icing is present, it is imperative that additional speed be added as required.

Note

During flight in icing conditions, carburetor heat should be used as required to maintain proper carburetor air temperature.

Turbulence and Thunderstorms

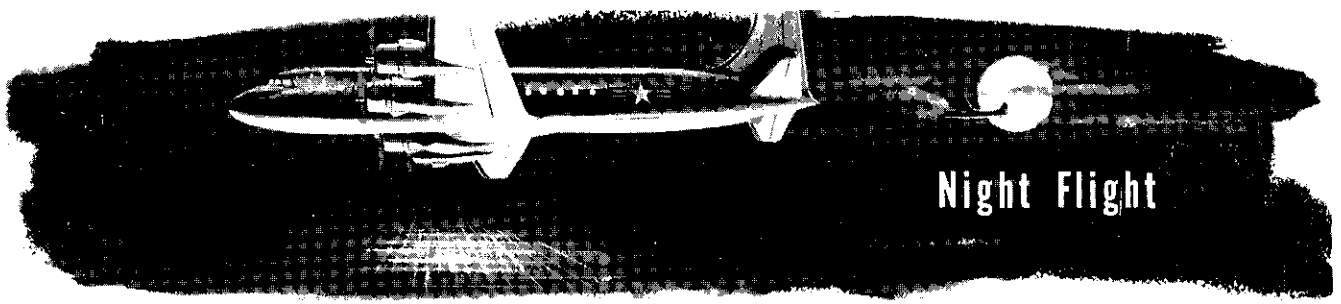
X1-109

The desired penetration airspeed of the aircraft should be established before entering the storm, and should be 60 knots (70 mph) IAS above the power-off stalling speed for its gross weight *(figure 6-1)*. It is imperative that the aircraft be prepared for entry into the zone of turbulence prior to reaching the storm. Normal approaching storm procedures will be used with the following additions:

1. Disengage the autopilot to permit the aircraft to respond freely to gust acceleration.
2. Bypass handle – Down.
3. Gear handle – UP.

WARNING

Do not lower the wing flaps, since structural damage may occur.



Night Flight

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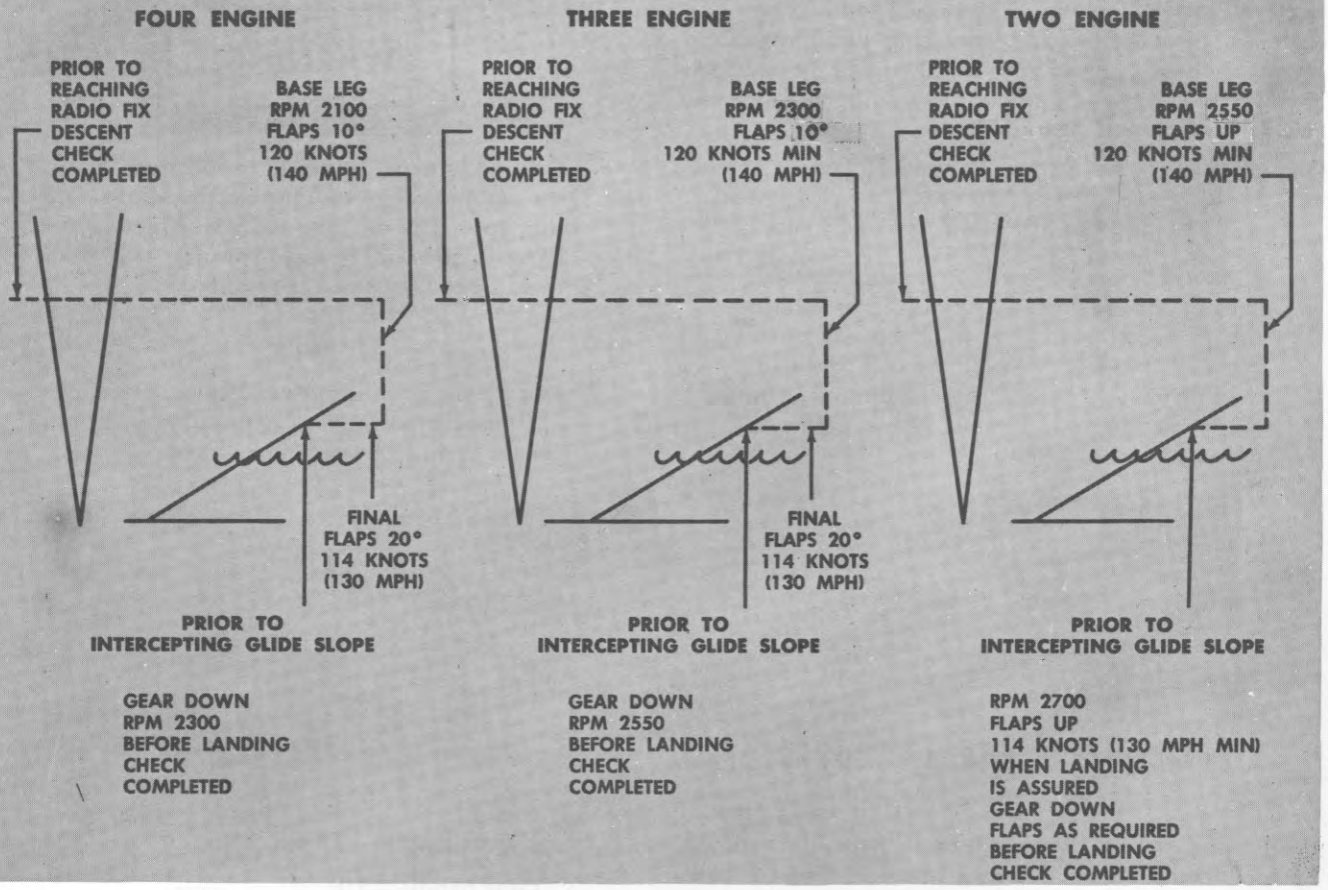
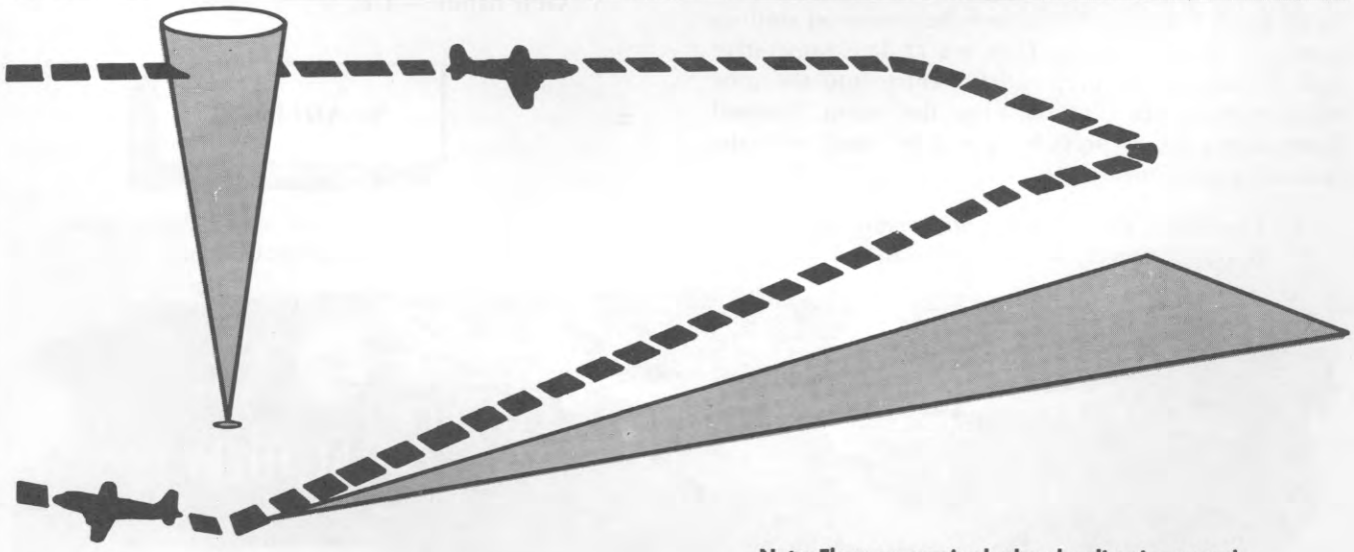
Night flight presents no unusual problems. Make certain that all lights are functioning properly before takeoff. ITO procedures are recommended for all night takeoffs to avoid flying back into the ground when visual outside references are lost immediately after takeoff.

GCA PROCEDURES — Typical

Note:
The pilot will advise the ground controller of the rate of turn that will be used during the procedure and request the controller to give a "GEAR DOWN" warning 10 seconds before glideslope interception.

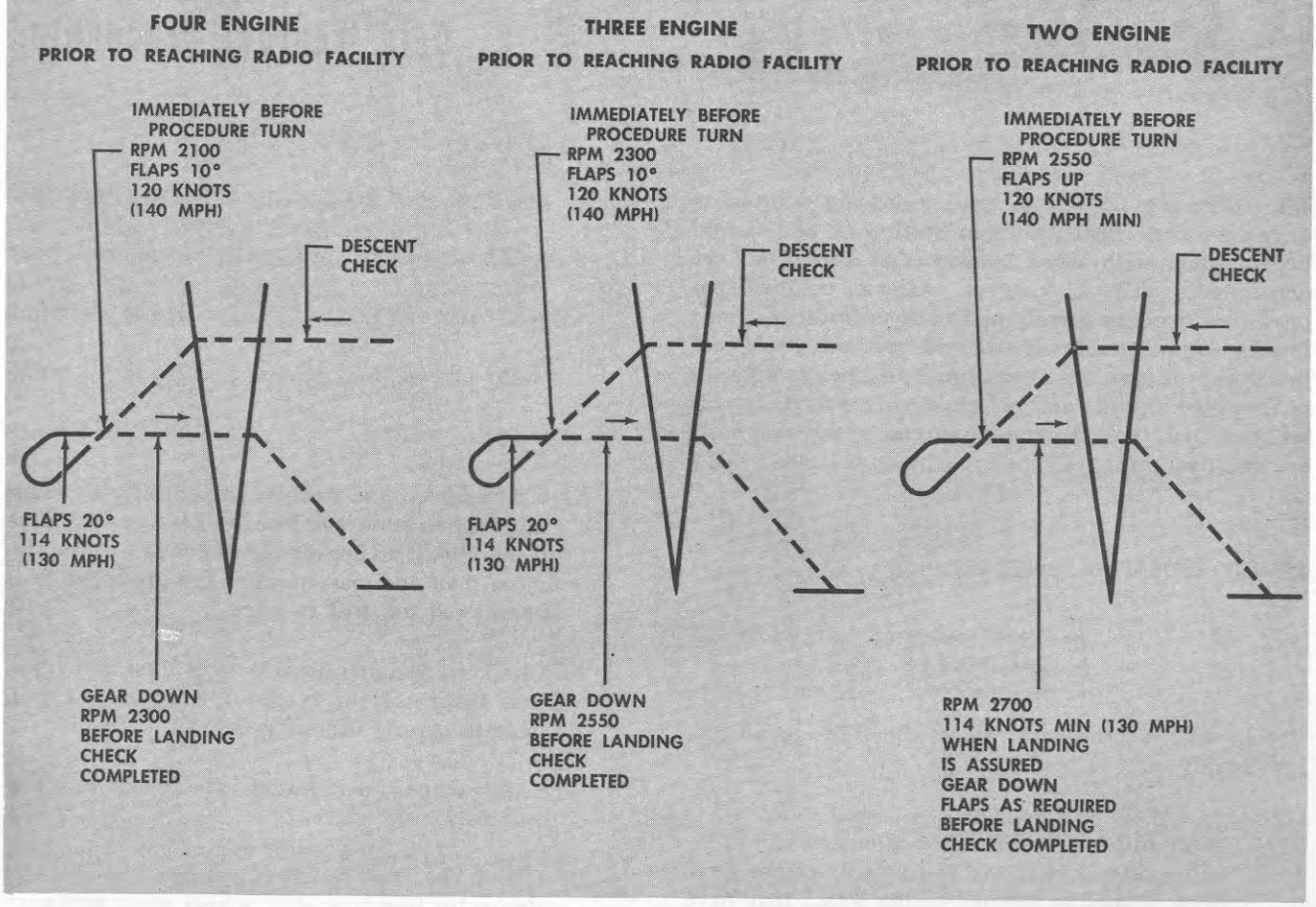


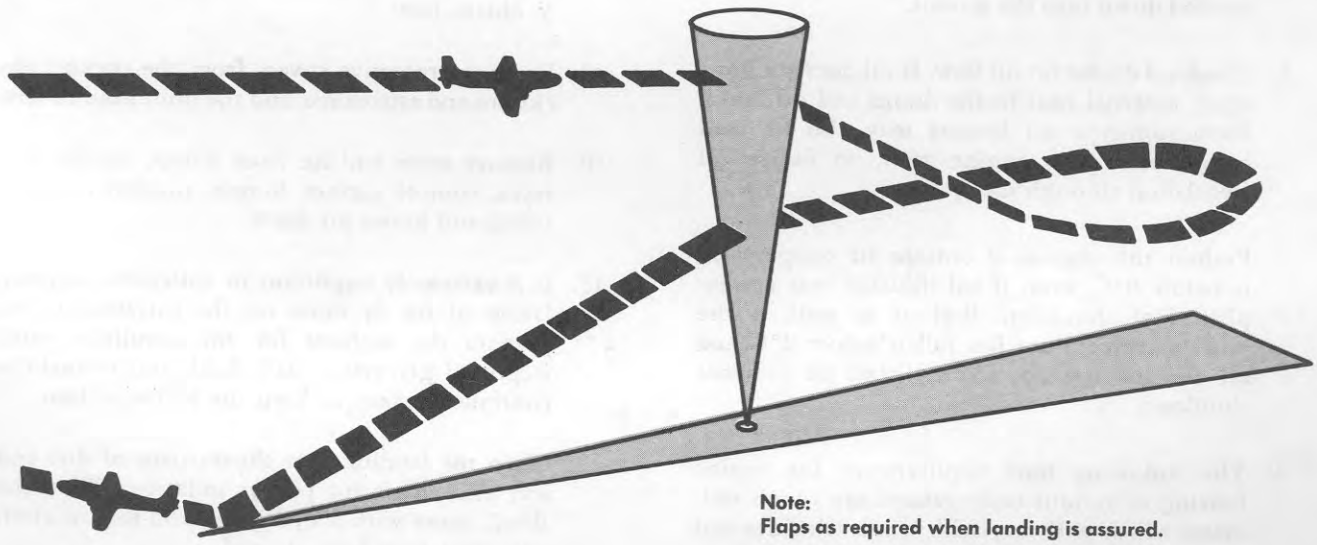


Note: Flaps as required when landing is assured.

Figure 9-3

RANGE, VOR, AND ADF PROCEDURES — Typical

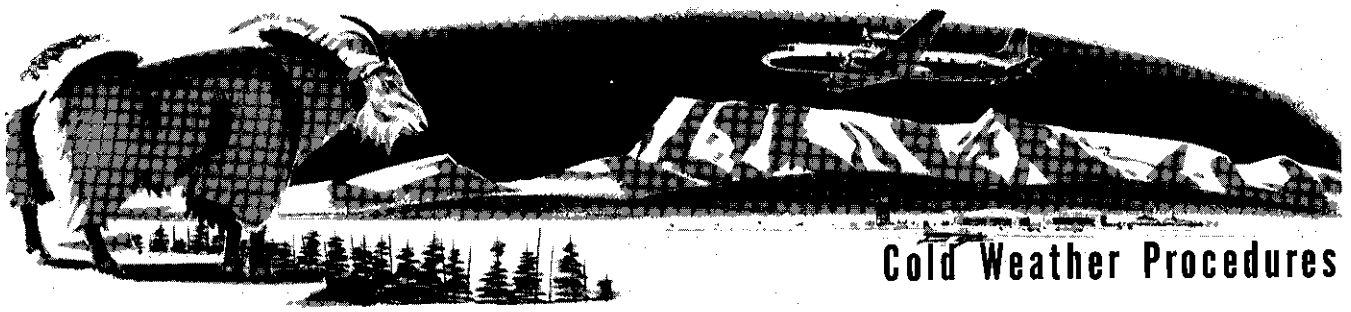




Note:
Flaps as required when landing is assured.

X1-34

Figure 9-4



Cold Weather Procedures

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The following operating instructions are written to supplement the instructions in Section II, and should be complied with when cold-weather conditions are encountered. The success of extreme cold-weather operation depends greatly upon the preparation made during engine shutdown after the previous flight and postflight procedures as outlined in the paragraphs on stopping engines and before leaving aircraft in this section; upon these depend the success of the next day's starting operation.

BEFORE ENTERING AIRCRAFT.

CAUTION

In cold weather operations, the fuselage oil supply must be diluted.

1. If oil dilution has been used after previous flight, make certain that the engine oil screens have been cleaned to remove sludge which may have washed down into the screens.

2. Check oil drains for oil flow. If oil does not flow, apply external heat to the drains and oil tanks. Immersion-type oil heaters may also be used before attempted engine start, to insure oil circulation through the system.

3. Preheat the engines if outside air temperature is below 0°C, even if oil dilution was accomplished at shutdown. Preheat as well, if the outside temperature has fallen below 2°C and oil dilution was not accomplished on previous shutdown.

4. The following time requirements for engine heating at various temperatures are rough estimates which will vary with wind velocities and percentage of engine oil dilution. The following tabulation is based on an oil dilution of approximately 25 per cent and no wind.

—6.7° to —18°C	½ hour (approx.)
—18° to —32°C	½ to 1 hour
—32° to —40°C	1½ to 2½ hours
—40° to —46°C	2½ to 3½ hours
—46° to —54°C	3½ to 5 hours

5. Check for engine stiffness periodically to determine when sufficient heating has been applied. Generally, if an engine is stiff enough to require more than one man to move the propeller, it is considered too stiff to start.

6. Check all fuel and oil tank vent lines and crank case breathers for freedom from frozen condensate. Apply heat if necessary.

7. Check that primer shutoff valve opens to allow free flow.

8. Check the fuel system for leaks and all fuel drains for free flow. Apply heat when necessary to obtain flow.

9. Remove protective covers from the cockpit enclosure and astrodome, and the pitot head covers.

10. Remove snow and ice from wings, control surfaces, control surface hinges, propellers, pitot tubes, and heater air ducts.

11. It is extremely important to anticipate accumulation of ice or snow on the surfaces and to prepare the surfaces for this condition with isopropyl glycerine, 3609 fluid, and to make a continuous effort to keep the surfaces clean.

12. Clean the landing gear shock struts of dirt and ice; also check for proper inflation. Wipe the shock struts with a hydraulic fluid-soaked cloth after they have been cleaned.

13. Check the tires for proper inflation.

14. Carefully inspect all openings in the aircraft for accumulation of snow.

15. Connect the external power source to the aircraft electrical system for starting engines and ground-checking electrical equipment.

ON ENTERING AIRCRAFT.

1. Start the cockpit and the cabin ground blowers and heaters to heat the flight instruments, defrost the windshields, and warm the radios, the dynamotors, the inverters, and other equipment within the aircraft.

Note

If the heaters do not ignite by use of the normal starting procedure, it will be necessary to apply external heat in the vicinity of the heaters to get them started. (In the meantime, external heat should be applied to the cockpit to heat the equipment within.)

2. Operate all the flight control surfaces and trim tabs through full travel three or four times to check ease of operation. When lowering flaps during normal preflight, the flaps should be lowered in 10 degree increments.

3. Check functioning of those instruments that can be checked without engine operation.

WARNING

In cold weather, make certain all instruments have warmed up sufficiently to insure normal operation. Check for sluggish instruments during taxiing.

BEFORE STARTING ENGINES.

I. Check the oil tank sump drain, and apply heat if the flow is unsatisfactory. Preheat should never be considered adequate until fluid oil will flow from the drain.

2. After the engines are preheated sufficiently, remove tbe engine covers or shields, heater ducts, and the oil immersion heaters.

STARTING ENGINES.

1. Use the normal starting procedure outlined in Section II, supplemented by the following:

2. Use high fuel boost. Turn fuel booster pump switch to LOW and allow fuel pressure to stabilize, then turn the switch to HIGH. This will prevent a sudden surge of fuel pressute rupturing the pump diaphragm.

3. Priming: Constant priming is required at low temperatures during the starting cycle of the engine and immediately after combustion until smooth operation is obtained. Do not use mixture control during priming.

4. If the engine has not started after 45 seconds of cranking, allow the starter to cool for 3 minutes before attempting another start.

5. If there is no oil pressure after 30 seconds of engine operation, shut the engine down immediately and investigate. The most common causes for lack of oil pressure are failure of the oil pressure gage to indicate properly due to congealed oil, or lack of fluid in the pressure lines.

6. High oil pressure immediately after engine start is not unusual, but, if prolonged, oil dilution may be used to reduce viscosity of the oil.

CAUTION

Dilute oil with care because engine failure can result from overdilution.

7. If outside air temperature is —20°C or below, apply carburetor heat as soon as possible after engine is started to assist in fuel vaporization and to reduce backfiring or afterfiring.

WARMUP AND GROUND TESTS.

Follow the normal warmup procedure outlined in Section II, with the following supplements:

I. When warming up an engine after oil dilution operation, it is preferable to allow the oil temperatures to rise above 60°C, and to increase the engine speed during the runup, in order to dissipate as much of the fuel as possible to allow the oil to return to its normal viscosity. Below this temperature, and at low engine speeds, very little fuel will be dissipated from the oil.

Note

Some deviation from the full open cowl flap position may be necessary during runup to obtain sufficient heated air for carburetor heat. *Full closed position will not be used* because of the lack of cooling air for the ignition harness and wiring.

2. Windshield alcohol anti-icing pump — Check pump operation.

3. Check the operation of the windshield wipers.

4. Check all instruments to see that they are operating within the proper limits.

WARNING

In cold weather, make certain all the instruments have warmed up sufficiently to insure normal operation. Check for sluggish instruments during taxiing.

5. Check the operation of all de-icer boots and the cockpit heating system.

WARNING

Before takeoff in cold weather, remove all snow and ice accumulation from wings, control surfaces, control surface hinges, propellers, pitot tubes, and heater air ducts. Depending on the weight of snow and ice accumulated, takeoff distances and climb-out performance can be seriously affected. The roughness and distribution of the ice and snow could vary stall speeds and characteristics to an extremely dangerous degree. Loss of an engine shortly after takeoff is a serious enough problem without the added, and avoidable, hazard of snow and ice on the wings. In view of the unpredictable and unsafe effects of such a practice, the ice and snow must be removed before flight is attempted.

TAKEOFF.

CAUTION

Pitot heat and windshield heat should be used during takeoff to prevent ice accretion. Do not use surface de-icers because of resultant disturbance of airflow over the wing.

1. At subzero temperatures, maximum takeoff power may be reached at a reduced manifold pressure because of the increase in air density. Check the engine power chart before takeoff.

2. As the takeoff run is begun, adjust the cowl flaps to the position required to maintain proper cylinder head temperatures. At temperatures of —44°C, the cowl flaps will probably have to be fully closed.

3. Carburetor heat should be applied as required, so that the fuel will vaporize properly at subzero (—20°C or below) temperatures. Regulate the carburetor heat to maintain carburetor air temperatures within the proper limits throughout engine runup, takeoff, climb, and cruise (see normal fuel grade operating limits, Section V).

4. If oil discharge from the engine breather is noted, operate the engine at reduced power if the oil discharge continues, land as soon as practicable.

AFTER TAKEOFF.

1. The landing gear should be cycled after takeoff from a slush-covered runway because of the possibility of the doors freezing shut as a result of slush pickup on the doors. The nosewheel door is especially susceptible to this condition. If the wheels are lowered with the doors frozen shut, structural damage to the doors will occur.

2. Carburetor heat should be used as required, to maintain proper carburetor air temperatures. Adjust the cowl flaps as required, to maintain proper cylinder head temperatures. Crosscheck all flight instruments and be alert for any erroneous indications.

IN FLIGHT.

Use carburetor heat as required to maintain carburetor air temperature within the desired range.

APPROACH.

1. Turn off the wing de-icer control switch at least 1 minute before landing.

2. Position the cowl flaps as required. At extremely low temperatures, below —48°C, it would be wise to effect a power-on approach, thus helping to keep the cylinder head temperatures from becoming critically low.

3. Apply carburetor heat as required. The crew engineer will regulate the carburetor preheat control levers while the pilot and copilot are occupied with tbeir duties in making the approach for a landing.

LANDING ON SNOW OR ICE-COVERED RUNWAY.

A slow touchdown speed is desirable, consistent with safe control. Hold the nosewheel off as long as possible. The brakes should be used as little as possible, and the nose steering wheel used gently but firmly.

STOPPING ENGINES.

Oil Dilution Procedure.

Note

Do not dilute if more than 65 hours have elapsed since the last dilution procedure, unless proper maintenance action has been accomplished.

1. When a cold-weather start is anticipated, the engine oil should be diluted with fuel before stopping the engines, provided that the engine oil temperature is maintained below 50°C. Above this temperature, dilution is not effective since the fuel introduced into the system will vaporize.

2. If it is necessary to service the oil tanks, shut down the engines and service them before diluting. Then restart and dilute as follows:

3. Turn the fuel booster pump switches to LOW to supply adequate fuel pressure.

4. Operate the engines between 1000 and 1200 rpm.

5. Maintain oil temperature below 50°C, and oil pressure above 15 psi. Should oil temperature exceed 50°C during the dilution period, stop the engine and wait until the oil temperature has fallen below 40°C before again starting the engine and resuming the dilution operation.

6. Dilute the oil, as required by the lowest anticipated air temperature, for the time indicated in the following table. Oil dilution operation is indicated by a substantial fuel pressure drop when the dilution switch is depressed. Make certain that fuel pressure returns to normal when the oil dilution switches are released.

Degrees C	*Dilution Time*
4° to —12°	3 minutes
—12° to —29°	6 minutes
—29° to —46°	9 minutes

Operate the oil dilution switches 1 minute for each additional 5°C below —46°C.

Note

If prestarting heat is guaranteed, dilute for only one half the recommended time.

7. Increase engine speed to 1300 rpm and exercise the propeller control levers through their entire range a number of times.

8. Depress the feathering switch for each propeller until a drop of 300 to 400 rpm is indicated, then pull the switch out and make certain that rpm returns to normal.

9. A short acceleration period of approximately 10 seconds at the end of the dilution run will usually clear the spark plugs from any fouling condition resulting from prolonged idling.

Note

Operate engines at 1500 rpm for approximately 1 minute before stopping engines, to help prevent plug fouling.

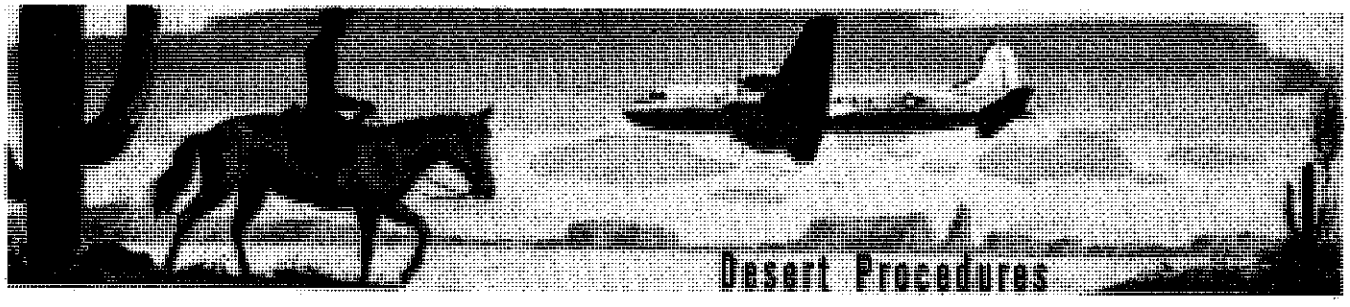
10. When dilution is complete, set throttles at approximately 800 rpm, move mixture controls to IDLE CUT OFF and continue to hold the oil dilution switches ON until the engines have stopped. Leave throttles in this position to aid in starting.

Note

During engine warmup, after an oil dilution operation, the oil temperature should be above 60°C. The engine rpm should be increased during the runup to dissipate as much of the dilutant fuel as possible; below this temperature and at low engine speeds very little gasoline will be driven out of the oil. Exercise the propellers and conduct the feathering check.

BEFORE LEAVING AIRCRAFT.

1. Release the parking brake to prevent freezing.
2. Drain condensation from fuel tank drains before the moisture in them freezes. If the fuel tanks are kept filled, condensation in fuel lines and drains will be minimized.
3. The oil tank sumps must be drained of condensation before moisture in them freezes or nondiluted oil congeals in these areas.
4. Inspect the vents and crankcase breathers and remove any existing ice.
5. Clean the landing gear shock struts of dirt and ice. Wipe the shock struts with a hydraulic fluid-soaked cloth after cleaning.
6. Install protective covers to guard against possible collection of snow and ice.
7. If the aircraft is to remain outside in freezing temperatures for a period of more than 4 hours, remove the batteries and stow them in a heated room.



Dust clouds in the desert may be found at altitudes as high as 10,000 feet. To diminish the chance of damage to the engines, an air filter should be installed in each carburetor airscoop for desert operation.

Note

Filters will not cause a decrease in the power available until the full throttle position is reached.

BEFORE ENTERING AIRCRAFT.

1. Cool the cabin and cargo compartment with portable air conditioners.
2. Inspect the oleo struts and tires for cleanliness and proper inflation.
3. Use a dry cloth to wipe the oleo struts free of dust and sand.
4. Remove the engine and aircraft covers, and the portable air conditioner.

ON ENTERING AIRCRAFT.

1. Operate all movable surfaces.
2. Remove dust and sand from the instrument panel with a lint-free cloth.

STARTING ENGINES.

Use the normal starting procedures.

ENGINE WARMUP.

1. Conduct ground operation in a minimum amount of time.
2. Watch cylinder head and carburetor air temperatures. Do not exceed limits.

BEFORE TAKEOFF.

Unless absolutely necessary, do not take off during sand or dust storms; if sand is blowing, run up the engines with the aircraft headed crosswind.

TAKEOFF.

1. Remember that longer runs are required for takeoff in excessive heat than at standard temperatures because of decreased air density.
2. Check cylinder head and carburetor air temperatures to be within limits.

LANDING.

Longer landing runs are required in extreme hot weather due to decreased air density.

STOPPING ENGINES.

Use the same procedure as outlined in Section II except stabilize the cylinder head temperatures at the lowest temperatures possible.

BEFORE LEAVING AIRCRAFT.

1. Install the pitot head covers and cockpit enclosure covers.
2. Install the engine covers after the engines have cooled.

Tropic Operation

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BEFORE ENTERING AIRCRAFT.

1. Cool the cabin and cargo compartment with portable air conditioners.
2. Check all fabric surfaces and control surface hinge points for freedom from fungi. If fungi are evident, remove them from all surfaces (except the fabric surfaces) with a stiff brush. Use a clean, soft cloth for the fabric surfaces.
3. Inspect the oleo struts and tires for cleanliness and proper inflation. Use a cloth moistened in hydraulic fluid to wipe the landing gear shock struts clean.
4. Remove engine covers and other protective covers.

ON ENTERING AIRCRAFT.

1. If necessary, warm the electrical instruments with an external source of heat until all moisture is eliminated.
2. Check the wing, empennage, fuselage, fuselage vents, and drain holes.

STARTING ENGINES.

Use the normal starting procedure.

BEFORE LEAVING AIRCRAFT.

1. Install the pitot covers and cockpit enclosure covers.
2. If possible, keep delicate equipment, such as communication equipment, etc, warmer than ambient temperature by approximately 6°C. If heating equipment is not available, circulation of air over this equipment will be helpful.
3. Leave the cockpit windows and cabin escape hatches slightly open to aid in air circulation. Close them during precipitation.

HIGH ELEVATION PROCEDURES.

The following procedures are recommended when operating from fields with an elevation that results in density altitudes of approximately 6000 to 16,000 feet. Experience has proven these procedures to be the most effective for safe and efficient high elevation operations.

STARTING.

The engine is more prone to flooding upon starting at density altitudes above 6000 feet, due primarily to reduction in density of the air flowing through the carburetor. The following techniques should be employed when starting at these altitudes.

1. Use larger throttle openings when starting.
2. Start in low blower.
3. When bringing in the mixture, move it to the AUTO-LEAN position.
4. HIGH fuel boost should be used when making a cold start at high altitude.

Note

To preclude damage to the carburetor metering diaphragm, pressurize fuel system first with LOW boost before selecting HIGH boost.

TAXIING.

Above 6000 feet density altitude, taxiing should be done at 1200 rpm in AUTO-LEAN. Care should be taken to avoid damage to the nose gear strut while taxiing at this higher power setting.

If necessary, manually lean mixtures to achieve a smooth idle.

ENGINE RUNUP.

Normal runup procedures wil be used at altitudes below 10,000 feet density altitude. At altitudes above 10,000 feet, where high blower will be used for takeoff, eliminate normal sequence of high blower check. Shift to high blower at 1700 rpm, just prior to advancing throttles for takeoff. Advance throttles to 2 inches above field barometric pressure and check power at 2250 (±50) rpm. Expedite runup to maintain cylinder head temperatures as low as possible.

TAKEOFF.

At altitudes below 10,000 feet, use low blower and normal takeoff procedure. Above 10,000 feet altitude, check gross weight, critical engine failure speed, takeoff speed, flap retraction and initial climb speed, and flap setting as prescribed in the operating procedures of the particular command. Monitor engine instruments closely, paying special attention to cylinder head temperatures. Before starting the takeoff run, advance throttles smoothly to 30 inches manifold pressure and adjust propeller rpm to 2550. Care should be taken to avoid abrupt power changes which could strain the impeller drive system. Release brakes and advance throttles to 43 inches, readjusting throttles and propellers as necessary to maintain 43 inches and 2550 rpm maximum. When the ambient temperature is colder than standard, it is necessary to reduce the manifold pressure by approximately ½ inch Hg for every 10°C below standard in order to avoid exceeding the part-throttle brake horsepower limit. Use minimum braking and control surface deflection necessary to maintain takeoff heading. Apply only enough forward pressure on the control column to keep the nosewheel in firm contact with the runway until directional control can be maintained by rudder; delay applying back pressure until just prior to reaching takeoff speed, attempting to obtain takeoff attitude simultaneously with takeoff speed. Retract gear when definitely airborne, raise flaps at prescribed flap retraction airspeed and accelerate to best three-engine climb speed while maintaining a positive rate of climb. Check cylinder head temperatures and adjust cowl flaps. Reduce to a safe climb power based on surrounding terrain, ambient air temperature, etc., when altitude permits.

APPROACH AND LANDING.

Normal low altitude traffic pattern, approach and threshold-indicated airspeeds are recommended; however, bear in mind that true airspeed increases with altitude for the same indicated airspeed and consequently, the landing ground roll will be appreciably extended at higher elevations. Another factor to consider is the decreased effect of aerodynamic braking (deceleration due to drag) with its resultant increase in the landing ground roll and amount of time/distance used in slowing from threshold to touchdown speed after the decision to land is made. Close adherence to the recommended approach speeds and flap settings are mandatory for the successful completion of either a landing or go-around. Do not use more than 20 degrees of flap until committed to land. After touchdown place mixture in AUTO-LEAN and blowers in LOW.

RESTRICTIONS.

Maximum takeoff and landing gross weight restrictions for high elevation airports will be as published by major commands.