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EMERGENCY PROCEDURES

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SECTION 3

EMERGENCY PROCEDURES

3.1 GENERAL

The recommended procedures for coping with various types of emergencies and critical situations are provided in this section. All of the required (FAA regulations) emergency procedures and those necessary for the operation of the airplane as determined by the operating and design features of the airplane are presented.

Emergency procedures associated with those optional systems and equipment which require handbook supplements are provided in Section 9 (Supplements).

The first portion of this section consists of an abbreviated emergency checklist which supplies an action sequence for critical situations with little emphasis on the operation of systems.

The remainder of the section presents amplified emergency procedures containing additional information to provide the pilot with a more complete understanding of the procedures.

These procedures are suggested as a course of action for coping with the particular condition described, but are not a substitute for sound judgment and common sense. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

Most basic emergency procedures, such as power off landings, are a normal part of pilot training. Although these emergencies are discussed here, this information is not intended to replace such training, but only to provide a source of reference and review, and to provide information on procedures which are not the same for all aircraft. It is suggested that the pilot review standard emergency procedures periodically to remain proficient in them.

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3.3 EMERGENCY CHECK LIST

SPEEDS

Air Minimum Control	76 KIAS
Best Single Engine Angle of Climb	104 KIAS
Best Single Engine Rate of Climb	106 KIAS
Maneuvering	160 KIAS
Never Exceed	236 KIAS

ENGINE INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE (FEATHERING PROCEDURE)

Throttle	close
Propeller	FEATHER (1000 RPM min.)
Mixture	IDLE CUT-OFF
Cowl flaps	close
Air conditioner	OFF
Magneto switch	OFF
Emergency fuel pump	OFF
Fuel selector	OFF (detent)
Fuel boost pump CB	pulled
Alternator CB switch	OFF
Prop. Sync.	OFF
Electrical load	reduced
Crossfeed	if required

ENGINE FAILURE DURING NORMAL TAKEOFF
(85 KIAS or below)

If sufficient runway remains for a safe stop:

Throttles ..... immediately close
Brakes ..... As required
Stop straight ahead

If insufficient runway remains for a safe stop:

Throttles ..... immediatley close
Mixtures ..... Idle cutoff
Master switch ..... OFF
Fuel selectors ..... OFF
Magneto switches ..... OFF

NOTE

Maintain directional control and maneuver to avoid obstacles.

ENGINE FAILURE DURING NORMAL TAKEOFF
(Above 85 KIAS)

Directional control ..... Maintain
Power (operating engine) ..... Max. continuous
Propeller control (inoperative engine) ..... Feather
Landing gear (in level or climbing flight) ..... Retract
Bank ..... 5° into operating engine
Airspeed ..... 95 KIAS to 50 ft, then accelerate to 104 KIAS
Cowl flaps (inoperative engine) ..... close
Airspeed ..... 106 KIAS, after all obstacles have been cleared
Engine securing procedures ..... Complete

NOTE

Land as soon as practical at the nearest suitable airport.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF
(92 KIAS or below)

If sufficient runway remains for a safe stop:

Throttles ..... immediately close
Land (if airborne) ..... on remaining runway
Brakes ..... as required

If insufficient runway remains for a safe stop:

Throttles ..... immediately close
Mixtures ..... IDLE CUT-OFF
Master switch ..... OFF
Fuel selectors ..... OFF
Magneto switches ..... OFF
Land (if airborne) avoiding obstacles

ENGINE FAILURE DURING SHORT FIELD TAKEOFF
(Above 92 KIAS but below 104 KIAS)

If sufficient runway remains for a safe stop:

Throttles ..... immediately close
Land ..... on remaining runway
Brakes ..... as required

If insufficient runway remains and the decision is made to abort the takeoff:

Throttles ..... immediately close
Landing gear ..... Extend

NOTE

Depending on terrain, it may be advisable to land with the gear retracted.

Flaps ..... Extend
Airspeed ..... 87 KIAS min.
Mixtures ..... IDLE CUT-OFF
Master switch ..... OFF

Fuel selectors ..... OFF
Magneto switches ..... OFF
Land avoiding obstacles

If insufficient runway remains, the terrain ahead is unsuitable for a safe landing and the decision is made to continue the takeoff:

Directional control ..... Maintain
Power (operating engine) ..... Max. Continuous
Propeller control (inoperative engine) ..... FEATHER
Landing gear (in level or climbing flight) ..... Retract
Bank ..... 5° into operating engine
Flaps ..... Retract in increments
Airspeed ..... Accelerate to 104 KIAS until all obstacles have been cleared then accelerate to 106 KIAS
Engine securing procedures ..... accomplish

WARNING

Negative climb performance may result from an engine failure occurring after lift-off and before the gear and flaps have been retracted, the failed engine propeller has been feathered, the cowl flap on the failed engine is closed and a speed of 106 KIAS has been attained. Refer to "Single Engine Climb" chart, Figure 5-21, for clean configuration positive climb performance.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF
(Above 104 KIAS)

Directional control ..... Maintain
Power (operating engine) ..... Max. Continuous
Propeller control (inoperative engine) ..... FEATHER
Bank ..... 5° into operating engine
Airspeed ..... Maintain 104 KIAS until clear of obstacles then accelerate to 106 KIAS

If sufficient runway remains for a safe stop:

Throttles ..... immediately close
Land ..... on remaining runway
Brakes ..... as required

If insufficient runway remains and the decision is made to abort the takeoff:

Throttles ..... immediately close
Landing gear ..... Extend

NOTE

Depending on terrain, it may be advisable to land with the gear retracted.

Flaps ..... Extend
Airspeed ..... 87 KIAS min.
Mixtures ..... IDLE CUT-OFF
Master switch ..... OFF
Fuel selectors ..... OFF
Magneto switches ..... OFF
Land avoiding obstacles

WARNING

Certain combinations of aircraft weight, configuration, ambient conditions and airspeeds will result in negative climb performance. (Refer to specific chart in Performance Section.)

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ENGINE FAILURE DURING CLIMB

Airspeed ..... maintain 106 KIAS
Directional control ..... maintain
Inop. engine ..... identify and verify
Inop. engine ..... complete Engine Securing Procedure

Land as soon as practical at nearest suitable airport.

ENGINE FAILURE DURING FLIGHT (Below 76 KIAS)

Rudder ..... apply towards operative engine
Throttles (both engines) ..... retard to stop turn
Pitch attitude ..... lower nose to accelerate above 76 KIAS
Operative eng. ..... increase power as airspeed increases above 76 KIAS

If altitude permits, a restart may be attempted.

If restart fails or altitude does not permit:
Inop. eng. prop ..... FEATHER
Trim ..... adjusted (5 ° bank into operative eng.)
Inop. eng. ..... complete Engine Securing Procedure
Cowl flap (operative eng.) ..... as required

ENGINE FAILURE DURING FLIGHT (Above 76 KIAS)

Inop eng. ..... identify
Operative eng. ..... adjust as required
Airspeed ..... attain and maintain at least 106 KIAS

Before securing inop. engine:
Fuel flow ..... check (if deficient - emergency fuel pump ON)
Fuel quantity ..... check
Fuel selector (inop. eng.) ..... switch to other tank containing fuel
Oil pressure and temp. ..... check
Magneto switches ..... check
Air start ..... attempt

If engine does not start, complete Engine Securing Procedure.

Power (operative eng.) ..... as required
Mixture (operative eng.) ..... full rich
Fuel quantity (operative eng. tank) ..... sufficient
Emergency fuel pump (operative eng.) ..... as required
Cowl flap (operative eng.) ..... as required
Trim ..... adjusted (5° bank into operative eng.)
Electrical load ..... decrease to min. required

Land as soon as practical at nearest suitable airport.

SINGLE ENGINE LANDING

Inop engine ..... Engine Securing Procedure complete
Hydraulic pump ..... check
Seat belts/harnesses ..... secure
Heater ..... FAN position
Emergency fuel pump (operative eng.) ..... ON
Mixture (operative eng.) ..... RICH
Propeller (operative eng.) ..... full FORWARD
Fuel selector on operative engine side ..... ON INBOARD tank
Crossfeed ..... OFF
Cowl flap (operative eng.) ..... as required
Airspeed ..... maintain 116 KIAS min. until landing is assured
Altitude ..... higher than normal until landing is assured

When landing is assured:

Gear ..... DOWN
Flaps ..... DOWN
Power ..... retard slowly and flare airplane
Trim ..... as power is reduced (airplane will yaw in direction of operative engine)

SINGLE ENGINE GO-AROUND

(Not possible from a full flap position unless sufficient altitude is available to raise flaps in a descent.)

Avoid, if possible, if necessary:

Airspeed ..... hold 106 KIAS
Power ..... max. on operating engine
Flaps ..... retract
Landing gear ..... retract
Cowl flaps on operative engine ..... as required
Trim ..... as required

AIR START (UNFEATHERING PROCEDURE)

Fuel selector ..... ON
Fuel boost pump CB ..... IN
Magnetos ..... ON
Throttle ..... open 1/2 inch
Propeller ..... 1/2 forward
Mixture ..... forward
Starter ..... engage until prop unfeathers
Propeller ..... pull back to low RPM position as propeller speed accelerates through 1000 RPM
Throttle ..... reduced power until warm; 2000 RPM max.
Alternator ..... ON
Engine instruments ..... check
Air conditioner ..... (as desired) ON
Propeller ..... manual sync with operating engine
Throttle ..... set as desired
Prop Sync. ..... (as desired) ON

ENGINE ROUGHNESS

Emergency fuel pumps ..... ON
Engine instruments ..... scan for cause
Mixture ..... adjust as required
Alternate air ..... OPEN
Cowl flaps ..... adjust for proper CHT
Fuel ..... switch tanks if fuel in second tank
Magnetos ..... check

ENGINE OVERHEAT

Cowl flaps ..... OPEN
Mixture ..... richen
Power ..... reduce
Airspeed ..... increase (if altitude permits)

LOSS OF OIL PRESSURE

Engine ..... secure per Engine Securing Procedure

ROUGH AIR OPERATION

Slow to manuevering speed or slightly less (7000 lbs. 160 KIAS)
Fly attitude and avoid abrupt maneuvers.
Seat belt and shoulder harness - tighten.

ENGINE FIRE ON GROUND (Engine start, taxi and takeoff with sufficient distance remaining to stop)

Firewall fuel shutoff ..... OFF
Emergency fuel pump ..... OFF
Boost pump CB ..... pulled
Brakes ..... as required
Throttle (affected engine) ..... OPEN
Radio ..... call for assistance
Mixture (if fire persists) ..... IDLE CUT-OFF
External fire extinguisher ..... use

NOTES

If fire continues, shut down both engines and evacuate.
If fire is on the ground, it may be possible to taxi away.

ENGINE FIRE IN FLIGHT

Firewall fuel shutoff ..... OFF
Throttle ..... forward
Mixture ..... full RICH
Engine ..... complete Engine Securing Procedures

If fire persists:
Airspeed ..... increase in attempt to blow out fire

Land at nearest suitable airport.

ELECTRICAL FIRE

Flashlight (at night) ..... located
Master switch ..... OFF
Circuit breakers ..... checked & pulled
All electrical switches ..... OFF
Master switch ..... ON
CB and switch for each unit (one at a time) ..... ON
CB and switch for failed unit ..... OFF

CROSSFEED

Fuel selector (inop. eng.) level flight ..... either tank
Boost pump CB (inop. eng.) ..... IN
Emergency fuel pump (inop. eng.) ..... ON
Crossfeed ..... ON
Fuel selector (op. eng.) ..... OFF
Boost pump CB (op. eng.) ..... pulled
Emergency fuel pump (op. eng.) ..... OFF

COMING OUT OF CROSSFEED (PRIOR TO LANDING)

Fuel selector (op. eng.) ..... INBOARD tank
Boost pump CB (op. eng.) ..... in
Emergency fuel pump (op. eng.) ..... ON
Crossfeed ..... OFF
Boost pump CB (inop. eng.) ..... pulled
Emergency fuel pump (inop. eng.) ..... OFF
Fuel selector (inop. eng.) ..... OFF

ONE ALTERNATOR INOP. LIGHT ON

Electrical load ..... reduced
Approp. side of master switch ..... OFF
Tripped CBs ..... reset
Approp. side of master switch ..... ON
Elec. Load (if light goes out) ..... reinstated
If light remains lit or alt. CB has tripped:
Approp. side of master switch ..... OFF
Electrical load ..... reduction continued

TWO ALTERNATOR INOP. LIGHTS ON

Repeat above procedure for each side.
If both lights stay on:
Master switch (both sides) ..... ON
Alternator CB switches ..... OFF
Electrical load ..... minimum
Land as soon as practical.

PROPELLER/GOVERNOR MALFUNCTIONS

RPM UNDERSPEED

Power ..... reduced
Mixture ..... RICH
If prop. moves to feather:
Mixture ..... IDLE CUT-OFF
Prop control ..... FEATHER
Engine ..... Engine Securing Procedures complete

NOTE

Propeller will move to feather if engine oil pressure is lost.

RPM OVERSPEED

Power ..... reduced
Airspeed ..... reduced
Prop control (if prop speed cannot be kept below 2575 RPM) ..... FEATHERED

NOTE

If prop will not feather, do not shut down engine.

Engine ..... Engine Securing Procedures complete if prop will feather

EMERGENCY GEAR EXTENSION

Airspeed ..... 153 KIAS max.
Gear selector ..... DOWN
Emerg. gear extender cover ..... opened
Emerg. gear extender ..... extended
Extender handle (till 3 green lights AND selector returns to neutral) ..... pumped

EMERGENCY EXIT

Exit (third window from front on right side) ..... locate
Plexiglas cover ..... remove
Handle ..... pull down
Emergency exit window ..... push out

GEAR UP LANDING

Ground personnel ..... inform (if possible)
Fuel ..... burn off (if time allows)
Passengers ..... briefed
Normal landing check list ..... complete
Gear selector ..... UP
Autopilot ..... OFF
Master switch (daytime) ..... OFF
Make a normal approach
When runway is made and landing assured:
Mixtures ..... IDLE CUT-OFF
Prop controls ..... FEATHER
Firewall fuel shutoffs ..... OFF
Fuel selectors ..... OFF
Touchdown at minimum airspeed and level attitude
Master switch (night) ..... OFF
Evacuate

NOTE

If nose gear is not extended, the landing light will not be functioning.

FLAP SYSTEM MALFUNCTION

ANNUNCIATOR LIGHT ON

Flap selector ..... reposition slightly
If flaps move ..... replace amplifier prior to next flight
If flaps do not move ..... check for split flaps
If flaps are split ..... pull flap motor CB and land in this condition
If flaps are not split ..... pull and reset flap motor CB
If flaps still do not operate ..... pull flap motor CB and land in this condition

FLAPS FAIL TO RESPOND TO FLAP SELECTOR (WITH FLAP INDICATOR POINTING TO OFF)

Flap control CB ..... pull and reset
If indicator remains "OFF" ..... the flap control is inoperative and flaps cannot be repositioned for landing or go-around
If indicator shows flap position ..... use following checklist

FLAPS FAIL TO RESPOND TO FLAP SELECTOR (WITH FLAP INDICATOR POINTING TO FLAP POSITION)

Flap test switch ..... push
If annunciator fails to light ..... follow ANNUNICATOR LIGHT on checklist
If annunciator lights ..... pull and reset flap motor CB
If flaps fail to respond ..... a flap drive fault may exist and further effort to reposition flaps may cause damage

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3.5 AMPLIFIED EMERGENCY PROCEDURES (GENERAL)

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action and probable cause of an emergency situation.

3.7 ENGINE INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE (FEATHERING PROCEDURE)

The engine securing procedure should always be accomplished in a sequential order according to the nature of the engine failure (ie., practice, engine failure during takeoff, engine failure during climb, etc.).

Begin the securing procedure by closing the throttle of the inoperative engine and moving its propeller control to FEATHER (fully aft) before the propeller speed drops below 1000 rpm. The inoperative engine mixture control should be moved fully aft to the IDLE CUT-OFF position. CLOSE its cowl flaps to reduce drag and turn OFF the air conditioner (if installed). Turn OFF the magneto switch, the emergency fuel pump switch and the fuel selector. Pull out the fuel boost pump circuit breaker and turn OFF the alternator circuit breaker switch of the inoperative engine. The propeller synchrophaser (if installed) should be OFF. Complete the procedure by reducing the electrical load and considering the use of the fuel crossfeed if the fuel quantity dictates.

ENGINE FAILURE DURING NORMAL TAKEOFF (85 KIAS or below)

Determination of runway length, single engine climb rate, and accelerate/stop distance will aid in determining the best course of action in the event of an engine failure during takeoff. If engine failure occurs while sufficient runway remains for a deceleration and a safe stop, cut power immediately and stop straight ahead.

If an engine failure occurs before an airspeed of 85 KIAS is attained, and there is not adequate runway remaining for deceleration and stop, immediately retard the throttle and mixture levers fully aft. Turn OFF the master switch, the fuel selectors, and the magneto switches. During these procedures, maintain directional control and maneuver to avoid obstacles if necessary.

ENGINE FAILURE DURING NORMAL TAKEOFF (Above 85 KIAS)

If an engine fails during takeoff at an airspeed above 85 KIAS the pilot must decide whether to abort following the preceding procedures or to continue the takeoff and climb on a single engine. The pilot's decision must be based on a personal judgment, taking into consideration such factors as remaining runway, obstacles, the type of terrain beyond the runway, density altitude, weight and loading, weather, airplane condition, and the pilot's own proficiency and capability.

WARNING

Certain combinations of aircraft weight, configuration, ambient conditions and airspeeds will result in negative climb performance. (Refer to specific chart in performance section.)

If takeoff is continued the airplane will tend to turn in the direction of the inoperative engine, since one engine will be inoperative and the other at maximum power. Rudder pedal force on the side of the operating engine will be necessary to maintain directional control. If rotation for takeoff has begun or the aircraft is just airborne, maintain the takeoff attitude of approximately 10°. The aircraft may skip along the runway or settle back to the runway, if airborne. Do not force the aircraft off the ground or raise the gear, but continue to maintain maximum power on the operating engine and the aircraft directionally aligned with the runway. Once the faulty engine is identified and its power loss verified, feather its propeller. The drag reduction resulting from feathering the windmilling propeller will provide a rate of climb increment which will allow the aircraft to accelerate to and remain airborne at the 50 foot barrier airspeed (95 KIAS). If the aircraft will maintain level flight or a positive rate of climb, retract the landing gear. Maintain 95 KIAS to the 50 foot barrier, then accelerate to 104 KIAS (best single engine angle of climb speed) until clear of obstacles and close the cowl flap on the inoperative engine. When above all obstacles accelerate to the best single engine rate of climb speed (106 KIAS), trim as necessary and CLOSE the cowl flaps on the operating engine as much as possible without exceeding engine temperature limits. After a climb has been established, complete the "Engine Securing Procedure" on the inoperative engine.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF (Below 92 KIAS)

Should an engine failure occur prior to reaching the barrier speed (92 KIAS), the takeoff should be aborted. If the failure occurs while the aircraft is still on the ground and sufficient runway or suitable overrun remains, retard the throttles and apply braking as necessary. If insufficient runway or suitable overrun exists, retard the throttles, apply braking as required, pull the mixtures to idle cut-off, turn the master switch, fuel selectors, magneto switches off and steer the aircraft to avoid obstacles.

Should the engine failure occur after the aircraft is airborne, lower the nose to maintain airspeed, retard the throttles and land on the remaining runway, the runway overrun or the most suitable area straight ahead avoiding obstacles. If the landing cannot be accomplished on the remaining runway or overrun prior to touchdown, pull mixtures to idle cut-off, turn the master switch, fuel selectors and magneto switches to the off position.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF (Above 92 KIAS but below 104 KIAS)

Should an engine failure occur above the barrier speed (92 KIAS), but below the best single engine angle of climb speed (104 KIAS), the decision to abort or continue the takeoff will be based on several factors including altitude, aircraft weight, suitable landing areas, pilot proficiency and ambient conditions. The two most important considerations; however, are the altitude gained prior to the engine failure and the availability of suitable landing areas ahead of the aircraft at the time of the failure.

Should a suitable landing area (remaining runway, overrun or an area relatively free of obstructions) be accessible from the point where the engine failure occurs, the takeoff should be immediately aborted and a power-off landing should be accomplished within that area.

If a suitable landing area is not available and sufficient altitude has been obtained, the pilot may elect to continue the takeoff. Should the decision be made to continue the takeoff, it is of the utmost importance to realize that the aircraft will have negative single engine climb performance until the gear and flaps have been retracted and an airspeed of 104 KIAS has been reached. As altitude may be lost during gear and flap retraction and the subsequent transition to 104 KIAS, the decision to continue the takeoff should primarily be based on the altitude gained prior to the failure. Flight tests have

indicated that as much as 100 feet may be lost during gear and flap retraction and the transition to the best single engine angle of climb speed (104 KIAS). The altitude loss is a difficult variable to quantify and is primarily predicted on pilot proficiency; however aircraft weight and ambient conditions must also be considered. Prior to takeoff, the pilot should always review the performance section to determine that adequate single engine climb performance exists for the takeoff weight and associated ambient conditions.

Should the decision be made to abort the takeoff, the throttles should be closed, the landing gear extended (terrain permitting), the flaps extended and a minimum airspeed of 87 KIAS should be maintained. If possible, plan to land in an area free of obstructions. Prior to touchdown, position the mixture controls to idle cut-off and turn the master switch, fuel selectors and magneto switches off.

Should the decision be made to continue the takeoff, maintain directional control, identify and then feather the inoperative engine. In level or climbing flight, retract the landing gear. Apply 5° of bank into the operating engine. As the aircraft starts to accelerate, retract the flaps incrementally (recommend 3-5° increments). After attaining 104 KIAS, maintain 104 KIAS until all obstacles have been cleared and then accelerate to 106 KIAS. Complete the engine securing procedures and land at the nearest suitable airport.

WARNING

Negative climb performance may result from an engine failure occurring after lift off and before the gear and flaps have been retracted, the failed engine propeller has been feathered, the cowl flap on the failed engine is closed and a speed of 106 KIAS has been attained. Refer to "Single Engine Climb" chart, Figure 5-21, for clean configuration positive climb performance.

ENGINE FAILURE DURING SHORT FIELD TAKEOFF (Above 104 KIAS)

If a suitable landing area exists at the point where the engine failure occurs, accomplish the aforementioned takeoff abort procedures.

If the decision is made to continue the takeoff, maintain directional control, apply maximum continuous power to the operating engine and feather the inoperative engine. Bank 5° into the operating engine and accelerate to 104 KIAS. Maintain 104 KIAS until all obstacles have been cleared, then accelerate to 106 KIAS. Complete the engine securing procedures and land at the nearest suitable airport.

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ENGINE FAILURE DURING CLIMB

If engine failure occurs during climb, a minimum airspeed of 106 KIAS should be maintained. Since one engine will be inoperative and the other will be at maximum power, the airplane will want to turn in the direction of the inoperative engine. Rudder pedal force on the side of the operating engine will be necessary to maintain directional control. After the faulty engine has been identified and power loss verified, complete the "Engine Securing Procedures." Continue a straight ahead climb until sufficient altitude (minimum of 1000 feet above ground elevation) is reached to execute the normal "Single Engine Landing" procedure at the nearest suitable airport.

Multi engine aircraft are required to climb at a given rate with one engine inoperative at 5000 feet. During this climb engine temperatures must remain at or below specific limits set by the engine manufacturer. Further, the established temperature limitations may not be exceeded on a 100° F day.

Cooling depends to a large extent upon airspeed and the outside air temperature.

This aircraft has a single engine Best Rate of Climb Speed of 106 KIAS. This speed yields a rate of climb in excess of the minimum required climb rate.

Should an engine failure occur on a cold day it may be possible to maintain engine temperatures below maximum allowable limits at 106 KIAS. When the outside air temperature is higher, a higher airspeed must be used until on a 100° F day the aircraft must be flown at 110 KIAS. At these speeds the aircraft will climb at the minimum required rate and still maintain temperatures at or below the temperature limitations of the engine. Normally, cylinder head temperatures can be maintained within limits through cowl flap adjustments. Climb rate will be reduced by approximately 50 FPM.

ENGINE FAILURE DURING FLIGHT (Below 76 KIAS)

Should an engine fail during flight at an airspeed below 76 KIAS, apply rudder towards the operative engine to maintain directional control. The throttles should be retarded to stop the yaw force produced by the inoperative engine. Lower the nose of the aircraft to accelerate above 76 KIAS and increase the power on the operative engine as the airspeed exceeds 76 KIAS.

After an airspeed above 76 KIAS has been established, an engine restart attempt may be made if altitude permits. If the restart has failed, or altitude does not permit, the engine should be secured. Move the propeller control of the inoperative engine to FEATHER and complete the "Engine Securing Procedure," Adjust the trim to a 5° bank into the operating engine. The cowl flaps on the operative engine should be adjusted as required to maintain engine temperatures within allowable limits.

ENGINE FAILURE DURING FLIGHT (Above 76 KIAS)

If an engine fails at an airspeed above 76 KIAS during flight, begin corrective response by identifying the inoperative engine. The operative engine should be adjusted as required after the loss of power has been verified. Attain and maintain an airspeed of 106 KIAS. Once the inoperative engine has been identified and the operating engine adjusted properly, an engine restart may be attempted if altitude permits.

Prior to securing the inoperative engine, check to make sure the fuel flow to the engine is sufficient. If the fuel flow is deficient, turn ON the emergency fuel pump. Check the fuel quantity on the inoperative engine side and switch the fuel selector to the other tank if a sufficient supply is indicated. Check the oil pressure and oil temperature and insure that the magneto switches are ON.

If the engine fails to start it should be secured using the "Engine Securing Procedure".

After the inoperative engine has been secured, the operative engine can be adjusted. Power should be maintained as required and the mixture control should be adjusted for power. Check the fuel supply and turn ON the emergency fuel pump if necessary. The cowl flaps on the operative engine should be adjusted as required to maintain engine temperatures within allowable limits. Adjust the trim to a 5° bank into the operating engine. The electrical load should be decreased to a required minimum. Land as soon as practical at the nearest suitable airport.

SINGLE ENGINE LANDING

If a single-engine landing is necessary, a check should be performed to determine whether or not the hydraulic pump is functioning for normal gear extension. This check is accomplished by placing the landing gear control in the UP position with the gear retracted. If the hydraulic pump is functioning, pressure will return the control to the neutral position. This check should be performed before entering the traffic pattern so that there will be time to pump the gear down with the hand pump if necessary.

The "Engine Securing Procedure" should be complete on the inoperative engine. Fasten the seat belts and shoulder harness and select the FAN position of the heater switch. The operative engine emergency pump should be ON and the mixture RICH. Advance the propeller control (operative engine) full forward. Check to ensure that the fuel selector is ON the main (inboard) tank on the same side as the operating engine. The fuel crossfeed valve should be OFF. The cowl flaps on the operative engine should be adjusted as required.

Maintain an airspeed of 116 KIAS or above and an altitude higher than normal until a landing is assured. When a landing is assured, extend the gear and flaps. Slowly retard the power on the operative engine and flare out the airplane for a normal landing. Trim as necessary as power is reduced. The airplane will tend to yaw toward the operative engine.

SINGLE ENGINE GO-AROUND

A single engine go-around should be avoided if at all possible. A go-around from a full flap position is not possible unless sufficient altitude is available to raise flaps in a descent. A final approach speed above 106 KIAS will place the airplane in the best configuration should a go-around be necessary.

To execute a single engine go-around, advance mixture, propeller, and throttle controls fully forward for maximum power on the operating engine. Retract flaps and landing gear. Maintain the airspeed at or above 106 KIAS. Set the trim and cowl flaps as required.

WARNING

A go-around should not be attempted after the airspeed is decreased below the best single-engine angle of climb speed (104 KIAS).

During climbs, the best single engine rate of climb speed of 106 KIAS is recommended; however, in high ambient temperatures, airspeed must be increased to 110 KIAS as required for improved cooling. Normally, cylinder head temperatures can be maintained within limits through cowl flap adjustments. Climb rate will be reduced by approximately 50 FPM.

AIR START (UNFEATHERING PROCEDURE)

Turn ON the fuel selector of the inoperative engine side and push in the fuel boost pump circuit breaker. Turn on the magnetos. Open the throttle ½ inch. Move the propeller control one half forward, and the mixture control, full forward. Engage the starter until the propeller is unfeathered. As the RPM passes 1000 coming out of feather, pull the propeller control back to the low RPM position to prevent excessive engine speed. Maintain the engine speed between 1800 and 2000 RPM, not exceeding 2000 RPM. This low power setting must be held until the engine is warmed up and oil pressure and temperature are stabilized within limits. Turn the alternator ON and check the engine instruments. The air conditioner and propeller synchrophaser (if installed) can then be turned ON.

3.9 ENGINE ROUGHNESS

If an engine falters or runs erratically, the cause may be fuel flow interruption, fuel contamination, icing or air starvation, or ignition problems. If roughness occurs, turn the emergency fuel pumps ON. Scan the engine instruments to see if the cause can be determined. Adjust the mixture controls for maximum smoothness; if the mixture is too rich or too lean, engine roughness may result. Open the alternate air control; a blocked induction system can cause roughness. If cylinder head temperatures are too high or too low, adjust the cowl flaps as required.

If the problem is in the fuel system, selecting another tank containing fuel may remedy the situation. A check of the magnetos will determine if they are operating properly.

3.11 ENGINE OVERHEAT

If engine temperatures become excessive, open the cowl flaps. Enriching the mixture and reducing power will also reduce engine temperature. If a more rapid reduction of engine temperature is desired, increase the airspeed by establishing a shallow dive.

3.13 LOSS OF OIL PRESSURE

Loss of oil pressure could be caused by a faulty pump, oil exhaustion, or a leak. A loss of oil pressure indication could be the result of a faulty gauge. In any event, continued operation of the engine could result in a serious emergency situation or severe engine damage.

Complete the "Engine Securing Procedure" (paragraph 3.7) on the faulty engine.

If engine oil is depleted, the engine will seize and if feathering is not initiated before 1000 RPM is reached, propeller will not feather.

3.15 ROUGH AIR OPERATION

In conditions of extreme turbulence, slow the airplane to maneuvering speed or slightly less. Maneuvering speed will decrease with the weight of the airplane - e.g., 160 KIAS at 7000 lbs., 156 KIAS at 6200 lbs. A reduction in speed will ease the stress to which the airplane is subjected by turbulence. Fly attitude and avoid abrupt maneuvers. Fasten seat belts and shoulder harnesses as a precaution against buffeting and lurching. When flying in extreme turbulence or strong vertical currents and using the autopilot, the altitude-hold should not be used.

3.17 ENGINE FIRE ON GROUND (Engine start, taxi and takeoff with sufficient distance remaining to stop)

The first step to extinguish the fire is to move the fire wall fuel shutoff valve to OFF. Next, turn OFF the emergency fuel pump and pull out on the fuel boost pump circuit breaker. This will stop the flow of fuel to the burning engine. The brakes should be used as required. OPEN the throttle. Use the radio to call for assistance.

If the fire persists, move the mixture control to IDLE CUT-OFF, shut down the engines and evacuate; the fire should be extinguished by an external means.

If the fire is on the ground near the airplane, it may be possible to taxi to safety.

3.19 ENGINE FIRE IN FLIGHT

If an engine fire occurs in flight, close the fire wall fuel shutoff valve of the faulty engine. Advance mixture and throttle full forward. Follow the feathering procedures to shut down the engine. After completion of the Engine Securing Procedures (Paragraph 3.7), and if the fire persists, increase airspeed as much as possible in an attempt to blow out the fire. Land as soon as possible at the nearest suitable airport.

3.21 ELECTRICAL FIRE

The presence of smoke in the cabin or the distinctive odor of smouldering insulation are indications of an electrical fire. The first step in coping with an electrical fire is to turn the master switch OFF. During night flight, be sure that a flashlight is in hand before turning off the master switch. Check for open circuit breakers; then pull all circuit breakers, and turn OFF all electrical switches and avionics switches.

Return the master switch to ON and, one unit at a time, turn ON the electrical switches and press in the circuit breakers for the individual units required for flight. When the faulty unit is located, pull its circuit breaker and turn its switch OFF. The failed unit should be left OFF for the remainder of the flight.

3.23 CROSSFEED

Crossfeed should be employed only when it is necessary to extend range during single-engine operation. Crossfeed must be OFF for takeoffs and landings.

To activate the crossfeed system, place the fuel selector valve of the inoperative engine side on either of the tanks on that side containing sufficient fuel quantity. Press in the fuel boost pump circuit breaker for the inoperative engine side, and turn ON the emergency fuel pump of the inoperative engine.

Turn ON the crossfeed valve located at the base of the control pedestal. Then, on the side of the operating engine, turn OFF the fuel selector, pull the fuel boost pump circuit breaker, and turn OFF the emergency fuel pump.

3.25 COMING OUT OF CROSSFEED (PRIOR TO LANDING)

To return to normal operation during a single-engine landing when the crossfeed system has been in use, first place the fuel selector on the operating engine side in the INBOARD tank position. Press in the fuel boost pump circuit breaker for the operating engine and turn ON its emergency fuel pump. Then turn OFF the crossfeed valve, and on the inoperative side, pull the fuel boost pump circuit breaker and turn OFF the emergency fuel pump and the fuel selector. It is recommended that the fuel system be returned to normal in sufficient time to determine normal operation prior to entering the landing pattern.

3.27 ONE ALTERNATOR INOPERATIVE LIGHT ON

In the event one of the alternator inoperative warning lights on the instrument panel illuminates, indicating an alternator failure, reduce the electrical load to the minimum necessary to sustain a safe flight. Turn OFF the side of the master switch corresponding to the side of the inoperative alternator. This will open the field circuit of the inoperative alternator. Reset any circuit breakers which may have popped. Return the appropriate side of the master switch to the ON position, and, if the alternator inoperative light has extinguished, reinstate the electrical load. If the warning light remains lit or if the alternator circuit breaker has tripped, return the corresponding side of the master switch to the OFF position, and continue the flight with a reduced electrical load.

3.29 TWO ALTERNATOR INOPERATIVE LIGHTS ON

If both alternator inoperative lights come on, repeat the above procedure individually for each side. Should both warning lights remain lit even after corrective action, turn ON both sides of the master switch and turn OFF both alternator circuit breaker switches. Reduce electrical load to an absolute minimum and terminate the flight as soon as possible, since all electrical power is being supplied by the airplane battery.

CAUTION

The alternator circuit breaker switches should not be opened manually when the alternators are functioning properly.

In case of the loss of both alternators, reduce electrical load by disconnecting the following equipment, as appropriate to the airplane:

(a) Turn OFF switches for the following:
  (1) Right pitot heat.
  (2) Cabin heater
  (3) Heated windshield
  (4) Autopilot
  (5) All unnecessary avionic equipment
  (6) Prop deicing
  (7) Alternator field switches

(b) Open the following circuit breakers:
(1) Right turn indicator
(2) Trim indicating system
(3) Instrument panel lighting (use flashlight)
(4) Map lights
(5) Cabin reading lights

CAUTION

If load shedding procedures have been carried out, the battery will provide electric power for approximately 35 minutes to complete a landing under IFR conditions including only a single flap extension and use of landing lights for a limited time. The above time depends upon the condition of the battery, temperature, and the time elapsed between alternator failure and load shedding.

3.31 PROPELLER/GOVERNOR MALFUNCTIONS

An internal malfunction of the propeller or governor could cause loss of RPM control and uncommanded movement of the propeller blades into high pitch or feather, or against the low pitch blade stop. A proper preflight check of the propeller governing and feather functions should indicate such malfunctions before takeoff. Should such a failure occur while airborne, the following actions are recommeded:

PROPELLER RPM UNDERSPEED

If an uncommanded RPM decrease occurs while operating at high power settings, immediately retard the throttle to a low cruise power setting and advance the mixture control to full RICH. If the propeller moves to feather, as indicated by a very low RPM and attendant vibration, shut down the engine with the mixture control (idle cut-off) and move the propeller control to FEATHER. (Refer to Engine Securing Procedures.)

NOTE

The propeller will move to feather if engine oil pressure is lost.

PROPELLER RPM OVERSPEED

An uncommanded RPM increase could indicate an internal failure that has caused the propeller to move to full low pitch. Initiate corrective action by immediately reducing the throttle setting and decreasing the airspeed with a nose-up attitude. If the propeller has moved to the low pitch stop, it is effectively a very low pitch fixed-pitch propeller and will exceed the 2575 RPM limit until both airspeed and manifold pressure have been reduced.

At idle throttle, airspeed must be reduced below 127 KIAS to maintain the propeller speed below 2575 RPM. Once airspeed has been reduced, usable power for low-speed cruise (near single engine best rate of climb speed) and approach will be available without exceeding 2575 RPM.

Once the propeller speed has been reduced to 2575 RPM by airspeed and power reductions, the pilot can test for regained RPM control with the propeller lever.

The engine should not be shut down if the propeller cannot be feathered since high drag would result from a windmilling propeller in low pitch. If engine shut down is desired, the pilot should first test for feathering ability with the engine running at idle throttle. (Refer to Engine Securing Procedures if propeller will feather.)

NOTE

Do not secure the engine if the propeller cannot be feathered.

3.33 EMERGENCY GEAR EXTENSION

If the landing gear fails to extend when the gear selector is placed in the DOWN position, the hand-operated emergency gear extender should be employed. The emergency gear extender is located beneath the access plate on the cabin floor, between the crew seats.

Before the gear is extended, the airspeed must be reduced below a maximum of 153 KIAS. To extend the gear by use of the emergency extender, the gear selector must be in the DOWN position.

When the emergency gear extender cover if lifted, note that instructions are printed inside. Extend the emergency gear handle completely, and pump the handle until the three green lights on the instrument panel indicate that all three gears are locked down (approximately 50 full strokes will be required to complete this operation). The master switch must be ON for the gear lights to illuminate. Continue pumping until hydraulic pressure builds and the gear selector returns to the neutral position.

3.35 EMERGENCY EXIT

An emergency exit is located on the right side of the fuselage, and is the third window from the front. With the cockpit-cabin divider installed, the emergency window will appear as the second window from the front on the right side of the cabin.

To use the emergency exit, remove the plexiglas cover over the handle; then pull the handle and push out on the window.

3.37 GEAR UP LANDING

If all normal and emergency gear extension procedures have failed, a gear up landing will be necessary. Select a suitable landing area. If possible, inform ground personnel of the emergency situation. If time allows, burn off excess fuel. Brief passengers on the use of the emergency exit and be sure that all occupants have seat belts and shoulder harnesses secured properly.

When ready to land, complete the landing checklist as for a normal landing, except that the gear selector should be in the UP position. Turn OFF the autopilot, and, in daylight, turn OFF the master switch. During a night landing when the master switch is left ON, the gear warning horn may sound when the throttles are retarded.

Make a normal approach, and when the runway is "made" and landing is assured, place mixtures in IDLE CUT-OFF, FEATHER the propellers, and turn OFF the fire wall fuel shutoffs and fuel selectors. Land smoothly, touching down in a level attitude. At night, turn OFF the master switch after touchdown. All occupants should evacuate as soon as the airplane has stopped.

NOTE

The landing light is attached to the nose gear. Therefore, if the nose gear is not extended, the landing light will not be functioning.

3.39 FLAP SYSTEM MALFUNCTION

In the event of a flap system failure which causes asymmetric ("Split") flaps, the flap drive stops automatically and the "flap" annunciator lights when the difference between the flaps reaches five degrees. If this occurs, no further control of the flaps is provided and the remainder of the flight including the landing and go-around if necessary, must be planned without repositioning the flaps. Asymmetric flaps may usually be identified by a rolling tendency, depending on the lift characteristics of the flaps at the positions where they fail.

A "FLAP" annunciator warning without asymmetric flaps can be caused by a failed amplifier. In this case, the flight may be continued with the knowledge that, in the event of asymmetric flaps, no further annunciator warning will exist. The amplifier should be replaced prior to the next flight.

Failure of the flaps to move without an asymmetric condition can be caused by a tripped flap control circuit breaker or flap motor circuit breaker at the circuit breaker panel on the left wall of the cockpit. If neither circuit breaker is tripped, a fault exists in the flap drive and further effort to reposition the flaps should be carefully considered so as not to compound the problem.

If a flap malfunction should occur and the flap control circuit breaker or the flap motor circuit breaker is not tripped, proceed accordingly to the Emergency Procedure Checklist on page 3-13.

CAUTION

Do not reset a tripped flap motor circuit breaker if a split flap condition exists.