

**CHAPTER 7
ABNORMAL FLOWS AND CHECKLISTS**

TABLE OF CONTENTS

ELECTRICAL FAULTS3
 Alternator Failure / Low Voltage.....3

INSTRUMENTS7
 Low vacuum indication / vacuum failure7
 Erroneous airspeed / altitude / vertical speed indications.....8

LANDING GEAR and TIRES.....9
 Manual landing gear extension9
 Gear up emergency landing12
 Landing with a flat nose tire14
 Landing with a flat main tire.....15

OTHER ABNORMAL SITUATIONS.....17
 Open Door In Flight.....17

CAUTION

DO NOT RUSH THESE PROCEDURES.

In nearly all situations involving abnormal problems, it is important to first realize that the airplane remains completely flyable to the limits of its fuel load.

Although any problem addressed in this chapter is to be considered serious, it is NOT grounds for hurrying a procedure and possibly missing a step that, if properly executed, would have resulted in correcting the problem.

Conduct the procedures carefully and systematically as a coordinated crew (when applicable) in combination with assistance received from outside sources.

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ELECTRICAL FAULTS

CAUTION

Whenever electrical failure is experienced in-flight, the electrical system is considered suspect even if normal operation appears to be restored after troubleshooting. The possibility of the failure re-occurring during the remainder of the flight must be kept in mind at all times, and the PIC should plan accordingly.

The electrical system must be checked by Maintenance as soon as possible.

WARNING

Do not reset a circuit breaker if it can be avoided. In all cases, NEVER reset a circuit breaker more than once.

CAUTION

Landing gear CANNOT be retracted without electrical power.

ALTERNATOR FAILURE / LOW VOLTAGE (Ammeter indicates ZERO output)

AMMETER FUNCTIONVERIFY BY LOADING THE ALTERNATOR
 VOLTAGE..... (if installed) CHECKED
 ELECTRICAL LOAD.....REDUCE
 ALTERNATOR CIRCUIT BREAKERS..... (as required) CHECK
 ► IF ALT CIRCUIT BREAKER POPS AGAIN..... DO NOT RESET

**- IF ALTERNATOR CIRCUIT BREAKERS ARE CLOSED
 OR REMAIN CLOSED AFTER RESET -**

ALT SIDE of MASTER SWITCH.....(for 3 seconds) OFF
 ALT SIDE of MASTER SWITCH..... ON
 AMMETER / VOLTAGE(if installed)..... CHECKED

- IF AMMETER INDICATES ZERO OUTPUT AGAIN -

ALTERNATOR SIDE OF MASTER SWITCH ONLY..... OFF
 ELECTRICAL LOAD..... MINIMIZE to ESSENTIAL ONLY
 BATTERY VOLTAGE..... (if installed) MONITOR
 TERMINATE FLIGHT..... AS SOON AS POSSIBLE
 ► IF IN VMC.....REMAIN AND LAND VFR
 ► IF IN IMC..... OBTAIN ATC ASSISTANCE TO NEAREST VMC

WARNING

If alternator output is not restored and battery is completely discharged, in the cases of total loss of electrical power, the gear will have to be deployed manually using Emergency Gear Extension procedures, and gear position lights will be inoperative even if emergency gear extension is successful.

Consult POH / AFM.

**ALTERNATOR FAILURE / LOW VOLTAGE
(Ammeter indicates ZERO output)
EXPANDED**

AMMETER FUNCTION VERIFY BY LOADING THE ALTERNATOR

Before executing the rest of the procedure, establish that the alternator output indicated on the ammeter is zero and not merely low, by activating an electrically powered device, such as a landing light. Then, check the ammeter to see if the alternator is producing electrical output. If the ammeter is still indicating zero when it should indicate a positive load, it would imply the alternator is indeed inoperative. Any indication greater than zero would imply that alternator is producing an electrical load.

VOLTAGE (if installed) CHECKED

If a voltage indicator is installed (such as JDM-700), appropriate to the specific aircraft, check the system voltage to confirm that the alternator is not producing proper output and that only battery voltage is indicated.

ELECTRICAL LOAD REDUCE

Turn off all non-essential equipment to minimize total electrical load. This will allow the battery to supply the essential electrical equipment for the longest possible time.

ALTERNATOR CIRCUIT BREAKERS (as required) CHECK

Check that the alternator circuit breakers are IN. If any are found to be out, and, in PIC judgment, the flight can be safely concluded as soon as possible on battery power, PIC may consider leaving the breaker out. If the decision was made that having the alternator is essential for the flight considering the circumstances, reset the alternator circuit breakers.

► IF ANY ALT CIRCUIT BREAKER POPS AGAIN..... DO NOT RESET

Under no circumstances should a circuit breaker be reset more than once. If it pops after one reset attempt, leave it out and continue on battery power. Before battery power runs out, enlist all necessary assistance, including ATC help, and land as soon as practical

- IF ALTERNATOR CIRCUIT BREAKERS ARE CLOSED OR REMAIN CLOSED AFTER RESET -

If the alternator breakers are found to be closed, or remain closed after the single reset attempt, perform the following actions.

ALT SIDE of MASTER SWITCH.....(for 3 seconds) OFF
Turn only the ALT side of the master switch to OFF and wait at least 3 seconds.

ALT SIDE of MASTER SWITCH..... ON
After the 3 second wait, turn the ALT side of the electrical master switch to ON, thereby completing recycling alternator.

AMMETER / VOLTAGE (if installed) CHECKED
Check the ammeter for proper alternator output indications. A zero indication would imply that the alternator is still not functioning. As described earlier in this procedure, load the alternator to check that the gauge indeed reads zero and is not merely low. Check the voltage indicator (if installed, appropriate to the specific aircraft) for the correct voltage, to determine if the alternator/charging system are functioning properly.

- IF AMMETER INDICATES ZERO OUTPUT AGAIN -

Perform the following action if the ammeter again indicates zero output, and it has been confirmed that the alternator is still inoperative, or has again become inoperative.

ALTERNATOR SIDE OF MASTER SWITCH ONLY..... OFF
Turn the alternator OFF, by moving the ALT side only of the master switch to the OFF position. The other side (battery) portion of the switch should remain on, to provide electrical power to the aircraft, supplied by the battery only.

CAUTION

Compass errors may occur when the alternator side of the battery master switch is in the OFF position.

ELECTRICAL LOAD MINIMIZE to ESSENTIAL ONLY
Turn OFF all non-essential electrical equipment to prolong battery life. Do not turn off the battery side of the master switch.

BATTERY VOLTAGE (if installed)..... MONITOR
Monitor battery voltage on the appropriate indicator (if installed in the aircraft) through the remainder of the flight to help determine when the battery is beginning to be depleted.

TERMINATE FLIGHT AS SOON AS POSSIBLE
Head to the nearest suitable airport and terminate the flight as soon as practical. Before battery power runs out, enlist all necessary assistance, including ATC help, for the successful conclusion of the flight. Have the electrical system checked out by Maintenance.

- ▶ **IF IN VMC..... REMAIN AND LAND VFR**
If in VMC, maintain VFR and divert to the nearest suitable airport to land under VFR.
- ▶ **IF IN IMC..... OBTAIN ATC ASSISTANCE TO NEAREST VMC**
Enlist ATC help in determining the nearest VMC/VFR conditions, and then divert to exit the IMC as soon as possible.

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INSTRUMENTS and VACUUM FAULTS

LOW VACUUM INDICATION / VACUUM FAILURE

AUXILIARY VACUUM SYSTEM (if installed)..... ON
 ENGINE RPM (as required) INCREASE
 ALTITUDE (if possible) DESCEND
 VACUUM GAUGE (4.9" – 5.1" hg) MONITOR
 ► *IF IN VMC* *REMAIN AND LAND VFR*
 ► *IF IN IMC*..... *OBTAIN ATC ASSISTANCE TO NEAREST VMC*

LOW VACUUM INDICATION / VACUUM FAILURE, EXPANDED

AUXILIARY VACUUM SYSTEM (if installed) ON
 If vacuum indications are low or complete vacuum failure is experienced, engage the auxiliary vacuum system, if installed in the aircraft. This may allow the flight to continue normally and land as soon as possible.

ENGINE RPM(as required) INCREASE
 Increase engine RPM, if practical, in order to increase the speed at which the vacuum pump turns, thus producing the most available vacuum pressure.

ALTITUDE (if possible) DESCEND
 If situation permits, descend to a lower altitude, which may allow the vacuum pump to produce acceptable vacuum pressure.

VACUUM GAUGE (4.9"-5.1" Hg) MONITOR
 Check the vacuum gauge for an indication of 4.9 to 5.1 inches Hg (Mercury). If this vacuum value cannot be maintained, the vacuum powered instruments are considered unreliable. Monitor secondary instruments and terminate the flight as soon as practical.

► **IF IN VMC** **REMAIN AND LAND VFR**
If in VMC, maintain VFR and divert to the nearest suitable airport to land under VFR.

► **IF IN IMC**..... **OBTAIN ATC ASSISTANCE TO NEAREST VMC**
Enlist ATC help in determining the nearest VMC/VFR conditions, and then divert to exit the IMC as soon as possible.

ERRONEOUS AIRSPEED / ALT / VSI INDICATIONS

- ALTERNATE STATIC SOURCEON
- PITOT HEAT (if in visible moisture).....ON
 - ▶ *IF IN VMC*..... *REMAIN AND LAND VFR*
 - ▶ *IF IN IMC*..... *OBTAIN ATC ASSISTANCE TO NEAREST VMC*

**ERRONEOUS AIRSPEED / ALT / VSI INDICATIONS,
EXPANDED**

- ALTERNATE STATIC SOURCEON

When erroneous pitot / static system indications are detected, activate the alternate static source by pulling the alternate static source valve lever out. Monitor the instruments to determine if the problem has been corrected.

- PITOT HEAT(as required) ON

If pitot mast blockage is suspected, especially in visible moisture, turn the pitot heat ON. Even if there is no visible moisture, previously trapped moisture in the pitot mast may have frozen, so consider using pitot heat as situation requires.

- ▶ *IF IN VMC*..... *REMAIN AND LAND VFR*
If in VMC, maintain VFR and divert to the nearest suitable airport to land under VFR.
- ▶ *IF IN IMC*..... *OBTAIN ATC ASSISTANCE TO NEAREST VMC*
Enlist ATC help in determining the nearest VMC/VFR conditions, and then divert to exit the IMC as soon as possible.

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LANDING GEAR and TIRES

CAUTION

DO NOT RUSH THESE PROCEDURES.

In nearly all situations involving problems with the landing gear, it is important to first realize that the airplane remains completely flyable to the limits of its fuel load.

Although any problem with the landing gear is to be considered serious, it is NOT grounds for hurrying a procedure and possibly missing a step that, if properly executed, would have resulted in correcting a previous mechanical problem and extending the landing gear.

Conduct the procedure carefully and systematically as a coordinated crew (when applicable) in combination with assistance received from outside sources.

WARNING

If all electrical power has been lost and battery depleted, the gear will have to be deployed manually using Emergency Gear Extension procedures, and the gear position light will be inoperative, even if emergency gear extension is successful.

Consult POH / AFM.

MANUAL LANDING GEAR EXTENSION

(normal extension failed, one or more green lights fail to illuminate)

► *IF SIMULATING.....PULL LANDING GEAR PUMP CIRCUIT BREAKER*

MASTER SWITCH..... ON
 CIRCUIT BREAKERS..... (as required) CHECK / RESET
 NAVIGATION and PANEL LIGHTS (in daytime) OFF
 LANDING GEAR SELECTOR SWITCH DOWN
 LANDING GEAR LIGHTS..... (swap bulbs if necessary) TESTED

- IF THE BULBS ARE NOT THE PROBLEM -

AIRSPEED.....BELOW 100 MPH
 LANDING GEAR SELECTOR SWITCH VERIFY DOWN
 EMERGENCY GEAR EXTENSION LEVER **HOLD DOWN**
 LANDING GEAR LIGHTS.....CHECK 3 GREEN, NO RED

- IF GEAR IS STILL NOT DOWN AND LOCKED -

YAW THE PLANE ABRUPTLY with RUDDEREXECUTE
 SLOW DOWN to MCA (if previous step failed)EXECUTE
 LANDING GEAR LEVER (at MCA)..... CYCLE UP, then DOWN

**MANUAL LANDING GEAR EXTENSION, EXPANDED
(normal extension failed, one or more green lights fail to illuminate)**

CAUTION

In any situation where a flight crew detects a problem with the landing gear, the flight crew shall terminate the training event and troubleshoot the problem. The crew shall contact the appropriate resources (BSU Dispatch if available by direct or relay communication, then ATC/Tower facility) prior to attempting a landing. This will ensure that the flight crew receives maximum available assistance prior to landing the aircraft.

► IF SIMULATINGPULL LANDING GEAR PUMP CIRCUIT BREAKER
If performing this procedure and simulating gear failure for training purposes, prior to execution, pull the LANDING GEAR PUMP circuit breaker out. This will prevent the landing gear pump from activating during the procedure.

MASTER SWITCHON
Verify that the master switch is ON.

CIRCUIT BREAKERS.....(as required) CHECK / RESET
Check the appropriate landing gear circuit breakers. If tripped, reset, but no more than once.

PANEL and NAVIGATION LIGHTS.....(in daytime) OFF
Check that PANEL and NAVIGATION LIGHTS are OFF. The landing gear indicator lights are dimmed when panel and navigation lights are on, and thus may appear to be inoperative.

LANDING GEAR SELECTOR SWITCHDOWN
Ensure that the landing gear selector switch is DOWN to perform the following landing gear indicator light checks.

LANDING GEAR LIGHTS..... (swap bulbs if necessary) TESTED
Check that all three (3) green landing gear lights are ON and that the red “Gear Up Warning” light is OFF. If any “gear down” green bulb fails to illuminate while another green bulb is lit, it is possible that the bulb is burned out while the gear is actually down. Troubleshoot by pulling out and switching the square green landing gear lights to test bulb/socket operation. **Execute this step deliberately and carefully to avoid dropping and losing either landing gear bulb.**

- IF THE BULBS ARE NOT THE PROBLEM -

If the bulb checks fail to establish the bulb as the problem, proceed with the manual gear deployment in the next steps.

AIRSPEEDBELOW 100 MPH
Slow down below the maximum manual gear deployment airspeed of 100 MPH.

LANDING GEAR SELECTOR SWITCHVERIFY DOWN
Ensure that the landing gear selector switch is DOWN.

EMERGENCY GEAR EXTENSION LEVER HOLD DOWN

Push the emergency gear extension lever DOWN and HOLD IT DOWN until manual gear deployment is complete, and only then release the lever.

LANDING GEAR LIGHTS CHECK 3 GREEN, NO RED

Check that all three (3) green landing gear lights are now ON and the red warning light is out. If any “gear down” green bulb still fails to illuminate while another green bulb is now lit, it is possible that the manual gear extension was successful but the bulb is burned out. Troubleshoot as before by pulling out and switching the square green landing gear lights to test bulb/socket operation.

- IF ANY GEAR IS STILL NOT DOWN AND LOCKED -

If all of the above steps fail to extend the landing gear, try the following steps. Consult POH / AFM for additional information.

YAW THE PLANE ABRUPTLY with RUDDER EXECUTE

Yaw the plane abruptly with the rudder in an attempt to dislodge the gear.

SLOW DOWN to MCA (if previous step failed) EXECUTE

If previous step failed to deploy the gear, slow down to minimum controllable airspeed in preparation for the next step.

LANDING GEAR LEVER (at MCA)..... CYCLE UP, then DOWN

While maintaining minimum controllable airspeed, recycle the landing gear switch. If all attempts to deploy the landing gear fail, prepare for Gear Up Emergency Landing.

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**GEAR UP EMERGENCY LANDING
(manual gear extension failed)**

SEATBELTS and SHOULDER HARNESSSES TIGHTEN
 FLAPS AS REQUIRED
 RUNWAY ASSURED

- BEFORE TOUCHDOWN -

FUEL SELECTOR OFF
 MASTER SWITCH OFF
 MAGNETO SWITCH OFF
 MIXTURE IDLE CUT-OFF
 TOUCHDOWN MINIMUM AIRSPEED
 EVACUATION COMPLETE

**GEAR UP EMERGENCY LANDING, EXPANDED
(manual gear extension failed)**

NOTE

If In case of a planned gear-up landing, this checklist assumes that all possible options for extending the landing gear have been exhausted, and that company dispatch and ATC assistance has been obtained and is standing by, as appropriate.

The flight crew should coordinate their interaction to ensure the procedure is conducted in a systematic and thorough manner. In a solo pilot operation, the pilot should verbalize and verify each step in the procedure as it is conducted.

CAUTION

Because of the unavailability of power after the execution of this procedure, it should be conducted only after the flight crew has committed to the landing.

SEATBELTS and SHOULDER HARNESSSES..... TIGHTEN

Ensure that all occupants have their seat belts and shoulder harnesses securely fastened, and TIGHTEN EACH INDIVIDUAL BELT, as the deceleration forces during gear up landing will be greater than during a normal landing.

FLAPS..... AS REQUIRED

Set flaps as desired for the approach and landing.

RUNWAY ASSURED

Establish on an approach with runway assured, and perform the following only when no possibility of a go-around exists.

- BEFORE TOUCHDOWN -

Once the runway has been assured, and before touchdown, perform the following steps.

- FUEL SELECTOR** **OFF**
Turn the fuel selector to OFF (depress the safety latch first) to cut the fuel supply from the tanks to the rest of the fuel system and thus minimize the risk of fire on touchdown.
- MASTER SWITCH**..... **OFF**
Turn the master switch OFF to minimize the risk of spark from energized electrical system.
- MAGNETO SWITCH** **OFF**
Turn the magneto switch OFF to minimize the risk of spark from the ignition system.
- MIXTURE**..... **IDLE CUT-OFF**
Move the mixture control to full aft, IDLE CUT-OFF position to cut the fuel to the engine.
- TOUCHDOWN**..... **MINIMUM AIRSPEED**
Touchdown softly at minimum airspeed.
- EVACUATION** **COMPLETE**
Promptly evacuate the aircraft and obtain external assistance.

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LANDING WITH A FLAT NOSE TIRE

- ▶ **RADIO** *TRANSMIT INTENTIONS*
- BEFORE LANDING CHECKLIST** **EXECUTE**
- TOUCHDOWN** **ON MAIN WHEELS ONLY**
- NOSEWHEEL** **HOLD OFF THE GROUND**
- AFTER NOSEWHEEL TOUCHDOWN** **YOKE FULL AFT**
- ▶ **TAXIING** *MINIMIZE*

LANDING WITH A FLAT NOSE TIRE, EXPANDED

NOTE

If a flat tire or tire separation occurs during takeoff and an aborted takeoff is not feasible, land as soon as practical.

- ▶ **RADIO** *TRANSMIT INTENTIONS*
Transmit aircraft condition and intentions on ATC, Tower, CTAF or UNICOM frequency, as appropriate.

BEFORE LANDING CHECKLIST **COMPLETE**

Execute the Before Landing Checklist in preparation for the approach. Plan to conduct a normal approach, as appropriate for the conditions.

TOUCHDOWN **ON MAIN WHEELS ONLY**

Do not allow the nosewheel come in contact with the ground during touchdown.

NOSEWHEEL **HOLD OFF THE GROUND**

Hold the nosewheel off the ground as long as possible while slowing down.

AFTER NOSEWHEEL TOUCHDOWN **YOKE FULL AFT**

After the nosewheel touches down, maintain FULL AFT yoke deflection to take as much weight as possible off the nosewheel.

- ▶ **TAXIING** *MINIMIZE*
Taxi as little as possible after landing. Clear the runway, as necessary, communicate with ATC and obtain external assistance. Do not taxi on a flat tire unless moving the aircraft is necessary for safety.

LANDING WITH A FLAT MAIN TIRE

- ▶ **RADIO** *TRANSMIT INTENTIONS*
- BEFORE LANDING CHECKLIST** **EXECUTE**
- FLAPS** **FULL**
- RUNWAY SELECTION** **CROSSWIND OPPOSITE FLAT TIRE**
- TOUCHDOWN POINT** **RWY SIDE OPPOSITE FLAT TIRE**
- TOUCHDOWN** **INFLATED TIRE FIRST**
- NOSEWHEEL** **LOWER IMMEDIATELY**
- AILERON** **HOLD OFF FLAT TIRE AS LONG AS POSSIBLE**
- ▶ **TAXIING** *MINIMIZE*

LANDING WITH A FLAT MAIN TIRE, EXPANDED

NOTE

If a flat tire or tire separation occurs during takeoff and an aborted takeoff is not feasible, land as soon as practical.

- ▶ **RADIO** *TRANSMIT INTENTIONS*
Transmit aircraft condition and intentions to ATC, Tower, CTAF or UNICOM frequency, as appropriate.

BEFORE LANDING CHECKLIST **COMPLETE**
 Execute the Before Landing Checklist in preparation for the approach. Plan to conduct a normal approach, as appropriate for the conditions.

FLAPS **FULL**
 Set flaps to FULL, to allow the airplane to touch down at the lowest possible speed.

RUNWAY SELECTION **CROSSWIND OPPOSITE DEFECTIVE TIRE**
 If possible, select a runway so that the crosswind comes from the side opposite the defective tire. It will allow the airplane to touch down on the inflated tire first. It will also assist in the directional control after touchdown, as the airplane will tend to weathervane into the wind and the force of wind will oppose the friction force of the defective tire. If no such runway is available, select the runway with the most headwind. Avoid runways with crosswind on the same side as the defective tire, as it will possibly cause a touchdown on the defective tire first, and have a detrimental effect on directional control after touchdown.

TOUCHDOWN POINT **RUNWAY SIDE OPPOSITE DEFECTIVE TIRE**
 Touch down on the runway side opposite the defective tire. That way, if the aircraft starts yawing toward the defective tire due to the friction drag it produces, there will be the greatest runway width safety margin while the pilot establishes aircraft directional control.

TOUCHDOWNINFLATED TIRE FIRST

Touch down on the inflated tire first. If crosswind exists from the side opposite the defective tire, the aircraft will naturally tend to touch down on the inflated tire. As the defective tire touches down following the inflated tire, anticipate immediate yawing motion toward the defective tire.

AILERON HOLD OFF FLAT TIRE AS LONG AS POSSIBLE

If possible, use the aileron to first hold off, then lighten the load on the defective tire by applying the aileron control in the direction of the side opposite the defective tire. The aileron on the defective tire wing would then deflect down, generating more lift, and the weight on the defective tire would be reduced.

► TAXIINGMINIMIZE

Taxi as little as possible after landing. Clear the runway, as necessary, communicate with ATC and obtain external assistance. Do not taxi on a flat tire unless moving the aircraft is necessary for safety.

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OTHER ABNORMAL SITUATIONS

OPEN DOOR IN FLIGHT

NOTE

In the unlikely event of open door in flight, the airplane normal flight characteristics will not be affected, and the airplane can land normally with the door open.

Therefore, it may be inadvisable for a single pilot to attempt to close the door, and proceeding to land may be the best course of action. Maintaining aircraft control shall be the utmost priority.

With two pilots occupying front seats, the following procedure may be attempted, with one pilot safely maintain control of the aircraft, while the other is executing the procedure and shutting the door.

OPEN DOOR IN FLIGHT

AIRSPEED..... BELOW 100 MPH
 CABIN AIR VENTS CLOSED
 STORM WINDOW OPEN
 IF TOP LATCH OPEN CLOSE IT
 IF LOWER LATCH OPEN... OPEN TOP LATCH, PUSH DOOR OUT, CLOSE RAPIDLY
 TOP LATCH..... CLOSE IT

OPEN DOOR IN FLIGHT, EXPANDED

AIRSPEED **BELOW 100 MPH**
 Slow down below 100 MPH in order to reduce airflow over the cabin door.

CABIN AIR VENTS **CLOSED**
 Close all cabin air vents in order to reduce air pressure inside the cabin, which would be working against the door during attempts to shut it.

STORM WINDOW **OPEN**
 Open the storm window on the left side, which will have the effect of slightly lowering the cabin pressure, and assisting in shutting the door.

IF TOP LATCH OPEN **CLOSE IT**
 If only the top latch is open, latch it shut.

IF LOWER LATCH OPEN .. OPEN TOP LATCH, PUSH DOOR OUT, CLOSE RAPIDLY
 If the lower latch is open, then open the top latch, push the door out and then close it rapidly. If done properly, this action will engage the lower latch.

TOP LATCH **CLOSE IT**
 With the lower latch engaged, top latch may also be latched closed, thereby completely securing the door.