

## Chapter 4 Emergency Procedures

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## General

This chapter contains the approved Bridgewater State College procedures for handling various emergencies while operating the Cessna 172R. The procedures are based on, and in some cases expand on the manufacturer’s procedural recommendations. An emergency would be any event (action or inaction) that endangers the flight crew, passengers, and/or the aircraft. The procedures in this section are intended to address predictable but rare situations where immediate, precise, and accurate crew action is required to reduce or eliminate the risk.

Flight crews are expected to thoroughly familiarize themselves with the contents of this chapter prior to operating the aircraft. Although training attempts to accurately simulate emergency situations, true emergencies deliver a significant psychological and physiological impact on the flight crew.

### **WARNING**

**The first and most important priority of the flight crew during an in-flight emergency is maintaining aircraft control for as long as possible, through to a safe landing.**

### **CAUTION**

*Any BSC aircraft involved in an in-flight emergency shall be grounded pending a complete inspection and approval for return to service, and can be released only with approval from the Chief Flight Instructor.*

## Use of the Checklist

When an emergency situation is encountered, flight crews shall follow the procedures within the **Emergency Checklist**. The **Emergency Checklist** is arranged by phase of operation (ground operations, takeoff, climb, cruise, descent, approach, landing) and contains the approved emergency procedures to be followed by BSC flight crews and shall be carried onboard the aircraft, readily accessible to the flight crew *at all times*. The procedures are based upon flight crew knowledge of aircraft systems and system interrelation. As such, some checklist items may be a condensed version of the procedures contained within the approved Pilot’s Operating Handbook / Aircraft Flight Manual. Situations presenting an immediate risk are identified on the **Emergency Checklist** for rapid and accurate action and must be accomplished from memory.

### **CAUTION**

*Flight crews shall execute the appropriate checklist procedures in response to an emergency situation. In the event of an emergency, the Pilot-In-Command may deviate from the Emergency Checklist procedures as necessary to ensure the safe outcome of the flight.*

Checklists in this and all Bridgewater State College standards manuals are printed in a manner to indicate the desired method and sequence of execution. The checklist shall be initiated when the Pilot Flying (PF) calls for the appropriate checklist. Tasks on the checklist may be performed prior to reference to the physical checklist, *but the checklist tasks shall be verified with the checklist in-hand.*

In the event the completion of a checklist sequence is interrupted, flight crews shall return to the checklist as necessary, including starting from the beginning if required, and *ensure that checklist tasks have actually been completed* when the checklist is reported as "COMPLETE".

**⊕ Immediate Action (Memory) Items**

Checklist tasks within the **solid-boxed** area at the beginning of a procedure denote immediate action items and *shall be accomplished from memory.* Remaining checklist tasks should be accomplished by reference to the printed checklist as the situation allows.

<b>Throttle</b> .....	<b>CHECK FORWARD</b>
<b>Mixture</b> .....	<b>RICH</b>
<b>Fuel Selector</b> .....	<b>BOTH</b>
<b>Auxiliary Fuel Pump</b> .....	<b>ON</b>

All other checklist procedure methods (Challenge/Response, Verbal/Response, Non-Response, Conditional Response) shall be accomplished per instructions provided in Chapter 3A, Normal Procedures.

**Flight Crew Conduct in Emergencies**

This section delineates procedures to be followed by flight crews during various emergencies. Because of the rarity of actual emergency situations in the training environment, flight crews are encouraged to utilize lesson tasks that focus on emergency situations as opportunities to hone both single pilot and crew coordination procedures.

**Ground Emergencies**

- ⊕ During ground emergencies, the Pilot Flying (PF) conducts the memory action items, and the Pilot Not Flying (PNF) assists as instructed by the PF. Crew coordination is essential. Tasks are to be completed in sequence, smoothly, accurately, and as rapidly as possible. Although the completion of tasks will follow a specified sequence, actions will be performed nearly simultaneously.
- ⊕ Any flight crew conducting an emergency procedure checklist on the ground in response to an actual emergency shall return the aircraft to the ramp for maintenance action.

## In-Flight Emergencies

During any in-flight emergency, the **PF** (if licensed and rated) will call for the appropriate emergency checklist. The **PNF** will perform the immediate action tasks from memory. The **PNF** will use the Challenge/Response method to accomplish the memory action tasks for any power or mixture control tasks, and fires.

### CAUTION

*BSC Flight Instructors are reminded that they are ultimately the PIC on any dual flight training event and are therefore responsible for the safe outcome of the flight. In any emergency, the PIC may request the flight controls from the PF if necessary.*

The emergency checklists contained in this section provide flight crews with a list of the tasks to be accomplished in the aircraft. Those same checklists and associated tasks are explained in detail in the expanded section of the chapter. The checklists must be accomplished from memory, if appropriate, *and then verified with the checklist in-hand.*

## Speed vs. Efficiency in Task Execution

*The most important and sophisticated technology in the aircraft is the pilot's mind.* His/her ability to analyze a rapidly changing situation, determine a desired outcome, select from available alternatives, act on the decision, evaluate the result and if necessary conduct that sequence several times over, presents the very best chance for a successful outcome. Where a pilot acts first, rushing through tasks and making mistakes, precious time is wasted by having to repeat previously missed steps in a procedure. In a true emergency situation, there is always time to *think first, then act efficiently and effectively*: The result prevents mistakes and the associated loss of time available to the flight crew.

All tasks in the approved Bridgewater State College Emergency Checklists are to be completed in sequence, smoothly, accurately, and as rapidly as possible. Although the completion of tasks will follow a specified sequence, actions will be performed nearly simultaneously. Instructors and students are expected to review and rehearse these procedures as necessary to achieve and maintain the expected level of proficiency.

During training operations, single-pilot execution of any emergency procedure listed in the chapter will be executed using the Verbal Response method.

**Airspeeds for Emergency Operations**

Best Angle of Climb ( $V_X$ ) .....	60 KIAS
Best Rate of Climb at sea level ( $V_Y$ ) .....	79 KIAS
Maneuvering Speed ( $V_A$ ) .....	82-99 KIAS
<b>Maximum Glide Speed (Flaps UP)</b>	
@ 2,450 lbs.....	65 KIAS
@ 2,100 lbs.....	60 KIAS
@ 1,600 lbs.....	53 KIAS
<b>Landing Without Engine Power (Maximum Takeoff Weight)</b>	
Flaps UP .....	65 KIAS
Flaps DOWN .....	60 KIAS

**Emergency Procedures Checklist**

<b>V/R</b>	<b>ENGINE FIRE DURING START</b>
<b>Ignition</b> .....	<b>CONTINUE CRANKING</b>
<b>IF ENGINE STARTS</b> .....	<b>1700 RPM for 1 MINUTE</b>
<b>Fuel Shutoff Valve</b> .....	<b>OFF</b>
<b>Mixture</b> .....	<b>IDLE CUT-OFF</b>
<b>Throttle</b> .....	<b>FULL FORWARD</b>
<b>IF ENGINE DOES NOT START</b>	
<b>Throttle</b> .....	<b>FULL</b>
<b>Mixture</b> .....	<b>IDLE CUT-OFF</b>
<b>Fuel Shutoff Valve</b> .....	<b>OFF</b>
<b>Aircraft</b> .....	<b>EVACUATE</b>
<b>Checklist</b> .....	<b>COMPLETE</b>

**WARNING**

While exiting the aircraft, exit toward the rear if possible, checking that evacuation path is clear of other aircraft, spinning propellers, and other hazards.

**V/R ENGINE FIRE DURING TAKEOFF (BEFORE V<sub>R</sub>)**

<b>Directional Control</b> .....	<b>MAINTAIN</b>
<b>Throttle</b> .....	<b>IDLE</b>
<b>Brakes</b> .....	<b>APPLY</b>
<b>Mixture</b> .....	<b>IDLE CUTOFF</b>
<b>Fuel Shutoff Valve</b> .....	<b>OFF</b>
<b>Master Switch</b> .....	<b>OFF</b>
<b>Ignition</b> .....	<b>OFF</b>
<b>Stop</b> .....	<b>STRAIGHT AHEAD</b>
<b>Aircraft</b> .....	<b>EVACUATE</b>
<b>Checklist</b> .....	<b>COMPLETE</b>

**V/R ABORTED TAKEOFF (BEFORE V<sub>R</sub>)**

<b>Directional Control</b> .....	<b>MAINTAIN</b>
<b>Throttle</b> .....	<b>IDLE</b>
<b>Brakes</b> .....	<b>APPLY</b>
<b>Stop</b> .....	<b>STRAIGHT AHEAD</b>
<b>Checklist</b> .....	<b>COMPLETE</b>

**V/R ENGINE FAILURE BEFORE V<sub>R</sub> (USABLE RUNWAY)**

<b>Directional Control</b> .....	<b>MAINTAIN</b>
<b>Throttle</b> .....	<b>IDLE</b>
<b>Brakes</b> .....	<b>APPLY</b>
<b>Stop</b> .....	<b>STRAIGHT AHEAD</b>
<b>Shutdown</b> .....	<b>EXECUTE</b>
<b>Checklist</b> .....	<b>COMPLETE</b>

**V/R ENGINE FAILURE AFTER V<sub>R</sub> (USABLE RUNWAY)**

<b>Airspeed</b> .....	<b>ESTABLISH BEST GLIDE</b>
<b>Directional Control</b> .....	<b>MAINTAIN</b>
<b>Mixture</b> .....	<b>IDLE CUTOFF</b>
<b>Fuel Shutoff Valve</b> .....	<b>OFF</b>
<b>All Switches (except Master)</b> .....	<b>OFF</b>
<b>Land</b> .....	<b>STRAIGHT AHEAD</b>
<b>Stop</b> .....	<b>STRAIGHT AHEAD</b>
<b>Checklist</b> .....	<b>COMPLETE</b>

**V/R ENGINE FAILURE AFTER V<sub>R</sub> (OUT OF USABLE RUNWAY)**

Airspeed ..... ESTABLISH BEST GLIDE  
 Directional Control ..... MAINTAIN  
 RESTART (Time Permitting) ..... ATTEMPT

**If NO TIME / NO RESTART:**

Mixture ..... IDLE CUTOFF  
 Fuel Shutoff Valve ..... OFF  
 All Switches (except Master & Avionics) ..... OFF  
 Radio ..... MAYDAY ON CURRENT FREQUENCY OR 121.5  
 Transponder ..... SQUAWK 7700  
 Flaps ..... AS REQUIRED

Master Switches ..... OFF  
 Doors ..... UNLATCH  
 Seatbelts/Shoulder Harnesses ..... SECURED  
 Landing ..... MINIMUM AIRSPEED  
 Checklist ..... COMPLETE

**V/R ENGINE POWER LOSS IN FLIGHT**

Airspeed ..... ESTABLISH BEST GLIDE  
 Heading ..... NEAREST AIRPORT  
 Throttle ..... CHECK FULL FORWARD  
 Fuel Shutoff Valve ..... ON  
 Mixture ..... RICH  
 Fuel Selector ..... BOTH  
 Auxiliary Fuel Pump ..... ON  
 Ignition ..... CHECK BOTH ON (Engage If Propeller Stopped)

Land ..... AS SOON AS POSSIBLE  
 Checklist ..... COMPLETE

**V/R LOW OIL PRESSURE**

Throttle ..... MINIMUM REQUIRED  
 Heading ..... NEAREST AIRPORT  
 Land ..... AS SOON AS POSSIBLE  
 Checklist ..... COMPLETE

**V/R ENGINE FAILURE IN FLIGHT / AIR RESTART**

Airspeed .....	ESTABLISH BEST GLIDE
Fuel Shutoff Valve .....	ON
Fuel Selector .....	BOTH
Auxiliary Fuel Pump .....	ON
Mixture .....	RICH
Throttle .....	OPEN ¼ INCH
Master Switch .....	ON
Ignition .....	CHECK BOTH ON (Engage If Propeller Stopped)
<b>IF NO RESTART:</b>	
Forced Landing Checklist .....	EXECUTE
Checklist .....	COMPLETE

**V/R ENGINE FIRE IN FLIGHT**

Mixture .....	IDLE CUTOFF
Fuel Shutoff Valve .....	OFF
Throttle .....	IDLE
Auxiliary Fuel Pump .....	OFF
Ignition Switch .....	OFF
Master Switches .....	OFF
Cabin Air Vents .....	CLOSED
Emergency Descent .....	EXECUTE
Forced Landing Checklist .....	EXECUTE
Checklist .....	COMPLETE

**V/R CABIN FIRE IN FLIGHT**

Battery/Master Switches .....	OFF
All Other Switches (except Ignition) .....	OFF
Cabin Heat .....	CLOSED
Cabin Air Vents .....	CLOSED
Fire Extinguisher (If Installed) .....	ACTIVATE
Cabin Air Vents (After Fire Extinguished) .....	OPEN
Windows .....	OPEN
Battery Master .....	ON, If Possible
Land .....	AS SOON AS POSSIBLE
Checklist .....	COMPLETE

**WARNING**

If the aircraft is in instrument conditions, turn Battery and ALT Master Switches OFF.  
If possible, turn the Battery Master Switch ON. Power from the battery will keep the aircraft systems operational long enough to allow the flight crew to execute an immediate diversion.

**V/R WING FIRE IN FLIGHT**

Pitot Heat ..... OFF  
Navigation Lights ..... OFF  
Strobe Lights ..... OFF  
Landing/Taxi Lights ..... OFF  
Sideslip ..... EXECUTE  
Land ..... AS SOON AS POSSIBLE  
Checklist ..... COMPLETE

**V/R FUEL PRESSURE DROP/LOSS**

Auxiliary Fuel Pump ..... ON  
Fuel Selector ..... BOTH  
Land ..... AS SOON AS PRACTICABLE  
Checklist ..... COMPLETE

**V/R ALTERNATOR FAILURE**

Alternator Circuit Breaker ..... CHECK – IN  
Ammeter ..... CHECK FOR BATTERY DISCHARGE  
If Circuit Breaker IN ..... CYCLE ALT SWITCH  
If Circuit Breaker OUT (Tripped)  
    Time ..... NOTE  
    All Electrical/Master Switches ..... OFF 15 SEC  
    ALT Circuit Breaker ..... RESET  
If ALT Circuit Breaker Fails to Reset  
    Battery Voltage ..... CHECK  
    Electrical Load ..... REDUCE  
    ALT CTL/GRD FAULT Breakers ..... PULL  
Land ..... AS SOON AS PRACTICAL  
Checklist ..... COMPLETE

**V/R LOW VOLTAGE INDICATION**

**Ammeter ..... CHECK FOR BATTERY DISCHARGE**  
**ALT Circuit Breaker ..... CHECK**  
**If Circuit Breaker IN..... CYCLE ALT SWITCH**  
**Electrical Load ..... REDUCE**  
**ALT CTL/GRD FAULT Breakers ..... PULL**  
**ALT Master Switch.....RECYCLE**  
**If Voltage Drop Continues:**  
**Land ..... AS SOON AS PRACTICAL**  
**Checklist ..... COMPLETE**

**V/R EMERGENCY DESCENT**

**Mixture ..... RICH**  
**Throttle ..... IDLE**  
**Airspeed ..... AS REQUIRED**  
**Checklist ..... COMPLETE**

**Maximum Glide..... 65 KIAS**

**NOTE**

Under ideal conditions the Cessna 172 glide ratio is 1.5 nautical miles per 1000’ of altitude loss.

**V/R FORCED LANDING**

If a flight crew has made sufficient attempts to restart the engine and determined that a forced landing is required, immediately survey the area and select a suitable field. Begin preparing for a forced landing.

First, the flight crew *must accept that they are going to conduct a forced landing, and that this is a real situation that is happening now.* Doing so in a decisive manner reduces the risk of denial of the situation, resultant poor planning, and an unsuccessful outcome, and clarifies the tasks at hand. The crew should select the intended landing area as early as possible to maximize available planning time, broadcast the situation (“squawk and talk”) and enlist support from ATC or other aircraft, and execute the landing procedure correctly on the first attempt.

If engine power remains available, fly over the intended landing area at a low enough but safe altitude to survey the terrain for obstructions, surface and wind conditions.



**V/R LANDING W/ FLAT NOSE TIRE**

**Radio** ..... **TRANSMIT CONDITION/INTENTIONS**  
**Approach** ..... **FLY NORMAL APPROACH**  
**Land** ..... **CENTER OF RWY**  
**Touchdown** ..... **SOFT-FIELD TECHNIQUE**  
**Directional Control** ..... **MAINTAIN**  
**Normal Shutdown** ..... **EXECUTE, DO NOT TAXI**

**V/R DITCHING**

**Radio** ..... **MAYDAY ON CURRENT FREQUENCY OR 121.5**  
**Transponder** ..... **SQUAWK 7700**  
**Loose Objects** ..... **SECURE, KEEP EXITS CLEAR**  
**Seatbelts/Shoulder Harnesses** ..... **SECURE**  
**Doors/Windows** ..... **UNLATCH**  
**Flaps** ..... **FULL DOWN, if possible**  
**ELT** ..... **ACTIVATE**  
**Descent** ..... **300 ft/min @ 65 KIAS**  
**Approach** ..... **PARALLEL SWELLS (If Possible)**  
**Touchdown** ..... **LANDING ATTITUDE @ MIN. AIRSPEED**  
**Aircraft** ..... **EVACUATE**  
**Life Vests/Raft (If Installed)** ..... **INFLATE**

**NOTE**

The above ditching procedures have not been demonstrated in the aircraft.

## Expanded Emergency Procedures

### ENGINE FIRE DURING START

Ignition ..... CONTINUE CRANKING

- ⊕ Hold key in START position and continue cranking.

IF ENGINE STARTS ..... 1700 RPM for 1 MINUTE

- ⊕ Run engine for approximately 1 minute at 1700 RPM to ensure fire is drawn into the power plant.

Fuel Shutoff Valve ..... OFF

- ⊕ Place fuel shutoff valve knob in the OFF (full out) position to stop fuel from being fed to the fuel pump.

Mixture ..... IDLE CUTOFF

- ⊕ Pull mixture control full aft to the OFF position to stop fuel from being fed to the power plant.

Throttle ..... FULL FORWARD

- ⊕ Push throttle full forward to maximize air flow and hasten burn-off of remaining fuel inside the power plant.

#### IF ENGINE DOES NOT START

Throttle ..... FULL FORWARD

- ⊕ Push throttle full forward to maximize air flow available to blow out the fire.

Mixture ..... IDLE CUT-OFF

- ⊕ Pull mixture control full aft to the OFF position to stop fuel from being fed to the power plant.

Fuel Shutoff Valve ..... OFF

- ⊕ Place fuel shutoff valve knob in the OFF (full out) position to stop fuel from being fed to the fuel pump.

Aircraft ..... EVACUATE

- ⊕ Release seatbelts/shoulder harnesses, open doors and exit the aircraft to the rear, away from the propeller area and fire. Ensure flight crew/passengers are all out of aircraft.

Checklist ..... COMPLETE

- ⊕ Verify the Engine Fire During Start checklist has been completed.

**ENGINE FIRE DURING TAKEOFF (BEFORE V<sub>R</sub>)**

- Directional Control..... MAINTAIN  
 ☒ Use rudder and brakes as necessary to keep the aircraft on the runway centerline.
- Throttle ..... IDLE  
 ☒ Pull throttle full aft to reduce power and slow the aircraft.
- Brakes ..... APPLY  
 ☒ Apply brakes as necessary to slow and stop the aircraft as safely and rapidly as possible.
- Mixture ..... IDLE CUTOFF  
 ☒ Pull mixture control full aft to the OFF position.
- Fuel Shutoff Valve ..... OFF  
 ☒ Place fuel shutoff valve knob in the OFF (full out) position to stop fuel from being fed to the fuel pump.
- Master Switch ..... OFF  
 ☒ Place ALT and BAT master switches in the OFF position to cut electrical power.
- Ignition..... OFF  
 ☒ Turn ignition to OFF position to disable the magnetos.
- Stop..... STRAIGHT AHEAD  
 ☒ Bring the aircraft to a full stop on the runway.
- Aircraft..... EVACUATE  
 ☒ Release seatbelts/shoulder harnesses, open doors and exit the aircraft to the rear, away from the propeller area and fire. Ensure flight crew/passengers are all out of aircraft.
- Checklist ..... COMPLETE  
 ☒ Verify the Engine Fire During Takeoff (Before V<sub>R</sub>) checklist has been completed.

**ABORTED TAKEOFF (BEFORE V<sub>R</sub>)**

- Directional Control..... MAINTAIN  
 ☒ Use rudder and brakes as necessary to keep the aircraft on the runway centerline.
- Throttle ..... IDLE  
 ☒ Pull throttle full aft to reduce power and slow the aircraft.
- Brakes ..... APPLY  
 ☒ Apply brakes as necessary to slow and stop the aircraft as safely and rapidly as possible.

Stop..... STRAIGHT AHEAD  
 ⊕ Bring the aircraft to a full stop on the runway.

Checklist.....COMPLETE  
 ⊕ Verify the Aborted Takeoff (Before V<sub>R</sub>) checklist has been completed.

**ENGINE FAILURE BEFORE V<sub>R</sub> (USABLE RUNWAY)**

Directional Control ..... MAINTAIN  
 ⊕ Use rudder and brakes as necessary to keep the aircraft on the runway centerline.

Throttle..... IDLE  
 ⊕ Pull throttle full aft to reduce power and slow the aircraft.

Brakes.....APPLY  
 ⊕ Apply brakes as necessary to slow and stop the aircraft as safely and rapidly as possible.

Stop..... STRAIGHT AHEAD  
 ⊕ Bring the aircraft to a full stop on the runway.

Shutdown..... EXECUTE  
 ⊕ Complete the Normal Procedures Parking and Securing checklist.

Checklist.....COMPLETE  
 ⊕ Verify the Engine Failure Before V<sub>R</sub> (Usable Runway) checklist has been completed.

**ENGINE FAILURE AFTER V<sub>R</sub> (USABLE RUNWAY)**

Airspeed ..... ESTABLISH BEST GLIDE  
 ⊕ Immediately establish aircraft pitch attitude to maintain 65 KIAS (Flaps Up) or 60 KIAS (Flaps Down) flying airspeed.

Directional Control ..... MAINTAIN  
 ⊕ Maintain control coordination and directional control of the aircraft, flying straight ahead to utilize the remaining runway landing surface and overrun area, as necessary.

Mixture..... IDLE CUTOFF  
 ⊕ Pull mixture control full aft to the OFF position.

Fuel Shutoff Valve.....OFF  
 ⊕ Place fuel shutoff valve in the OFF (full out) position.

All Switches (except Master) ..... OFF  
 ⊕ Place all electrical switches except the Master switches in the OFF position.

Land..... STRAIGHT AHEAD

- ✦ Use normal or short-field technique as necessary to land straight ahead on the remaining runway landing surface or overrun area, as necessary.

Stop..... STRAIGHT AHEAD

- ✦ Apply brakes and bring the aircraft to a full stop on the runway.

Checklist ..... COMPLETE

- ✦ Verify the Engine Failure After  $V_R$  (Usable Runway) checklist has been completed.

### **ENGINE FAILURE AFTER $V_R$ (OUT OF USABLE RUNWAY)**

Airspeed..... ESTABLISH BEST GLIDE

- ✦ Immediately establish aircraft pitch attitude to maintain 65 KIAS (Flaps Up) or 60 KIAS (Flaps Down) flying airspeed.

Directional Control..... MAINTAIN

- ✦ Maintain control coordination and directional control of the aircraft, and fly toward a suitable landing area.
- ✦ DO NOT attempt a gliding turn back to the departure runway below 1000' AGL *and safe landing is reasonably assured.*

RESTART (Time Permitting)..... ATTEMPT

- ✦ If time permits, attempt to restart the aircraft using the Engine Failure In Flight/Air Restart checklist.

If NO TIME / NO RESTART:

- ✦ The Pilot-In-Command is the final authority as to the operation of the aircraft. It is the PIC's choice to attempt an engine restart or bypass that attempt as conditions and time demand. The ultimate goal is the safest possible outcome in a highly difficult and demanding situation.

Mixture ..... IDLE CUTOFF

- ✦ Pull mixture control full aft to the OFF position to minimize risk of fire after landing.

Fuel Shutoff Valve ..... OFF

- ✦ Place fuel shutoff valve in the OFF (full out) position to minimize risk of fire after landing.

All Switches (except Master and Avionics) ..... OFF

- ✦ Place all electrical switches except Master and Avionics in the OFF position.

- Radio.....MAYDAY; CURRENT FREQUENCY OR 121.5  
 ☒ Broadcast: “Mayday-Mayday-Mayday, Tail #, Engine Failure/ Forced Landing, Location, # of Souls Aboard” on current frequency (Tower, CTAF) or on 121.5, as appropriate.
- Transponder..... SQUAWK 7700  
 ☒ Set squawk code to 7700 and IDENT.
- Flaps.....AS REQUIRED  
 ☒ Set flaps as required, full down preferred to minimize airspeed.
- Master Switch..... OFF  
 ☒ Place Master switches in the OFF position.
- Doors.....UNLATCH  
 ☒ Unlatch and open doors before landing to prevent them from being jammed closed as a result of ground impact.
- Seatbelts/Shoulder Harnesses..... SECURED  
 ☒ Ensure all flight crew/passengers are secured in their seatbelt/shoulder harness.
- Landing ..... MINIMUM AIRSPEED  
 ☒ Maintain minimum landing airspeed appropriate for the conditions.
- Checklist.....COMPLETE  
 ☒ Verify the Engine Failure After V<sub>R</sub> (Out of Usable Runway) checklist has been completed.

**ENGINE POWER LOSS IN FLIGHT**

- Airspeed ..... ESTABLISH BEST GLIDE  
 ☒ Establish pitch attitude to maintain 65 KIAS (Flaps Up) or 60 KIAS (Flaps Down) in anticipation of complete engine failure. ASSUME that complete engine failure is imminent and act accordingly to minimize risk.
- Heading ..... NEAREST AIRPORT  
 ☒ Determine and divert to the nearest usable airport.
- Throttle..... CHECK FULL FORWARD  
 ☒ Check throttle position and push full forward to develop maximum available power.
- Fuel Shutoff Valve..... ON  
 ☒ Check fuel shutoff valve knob position and push full in to develop maximum available fuel flow.

Mixture ..... RICH

- ⊕ Set mixture control to full rich to maximize fuel flow to the power plant. If power loss worsens, decrease mixture accordingly to optimize performance. Adjust as required.

Fuel Selector ..... BOTH

- ⊕ Ensure fuel selector is on BOTH to eliminate risk of blockage or fuel contamination from a single tank.

Auxiliary Fuel Pump ..... ON

- ⊕ Place the auxiliary fuel pump in the ON position to increase fuel pressure to the power plant.

Ignition..... CHECK BOTH ON (Engage If Propeller Stopped)

- ⊕ Verify ignition is set to BOTH/ON position. Test magnetos one at a time. If a failed magneto is the cause of the power loss, run on the operative magneto for the remainder of the flight.

Land..... AS SOON AS POSSIBLE

- ⊕ Fly a normal approach and land as soon as possible.

Checklist ..... COMPLETE

- ⊕ Verify the Engine Power Loss in Flight checklist has been completed.

## **LOW OIL PRESSURE**

Throttle .....MINIMUM REQUIRED

- ⊕ Reduce throttle to the minimum power setting required to maintain level flight.

Heading.....NEAREST AIRPORT

- ⊕ Determine and divert to the nearest usable airport.

Land..... AS SOON AS POSSIBLE

- ⊕ Fly a normal approach and land as soon as possible.

Checklist ..... COMPLETE

- ⊕ Verify the Low Oil Pressure checklist has been completed.

**ENGINE FAILURE IN FLIGHT / AIR RESTART**

- Airspeed ..... ESTABLISH BEST GLIDE
  - ⊕ Establish best glide airspeed 65 KIAS (Flaps Up) or 60 KIAS (Flaps Down). Glide ratio at maximum gross weight, flaps up, propeller windmilling, and 65 KIAS is 1.5 nm per 1000' altitude loss.
  
- Mixture.....RICH
  - ⊕ Set mixture control to full rich to maximize fuel flow to the power plant.
  
- Fuel Shutoff Valve..... ON
  - ⊖ Ensure fuel shutoff valve is on by pushing it full in.
  
- Fuel Selector..... BOTH
  - ⊕ Ensure fuel selector is on BOTH to eliminate risk of blockage or fuel contamination from a single tank.
  
- Auxiliary Fuel Pump..... ON
  - ⊖ Place the auxiliary fuel pump in the ON position to increase fuel pressure to the power plant.
  
- Throttle.....OPEN ¼ INCH
  - ⊕ Set throttle to ¼ inch open to provide air for engine start.
  
- Master Switch..... ON
  - ⊕ Verify ALT and BAT master switches are in the ON position.
  
- Ignition .....CHECK BOTH ON (Engage If Propeller Stopped)
  - ⊕ Verify ignition is set to BOTH/ON position. Test magnetos one at a time. If propeller is stopped, engage the starter to restart the engine.
  
- IF NO RESTART:
- Forced Landing Checklist ..... EXECUTE
  - ⊕ Execute the Forced Landing checklist.
  
- Checklist.....COMPLETE
  - ⊖ Verify the Engine Failure In Flight / Air Restart checklist has been completed.

**ENGINE FIRE IN FLIGHT**

- Mixture ..... IDLE CUTOFF  
 ☒ Pull mixture full aft to the OFF position to cut off the fuel supply to the power plant.
- Throttle ..... IDLE  
 ☒ Pull throttle full aft to the IDLE position to reduce the airflow to the fire.
- Fuel Shutoff Valve ..... OFF  
 ☒ Place fuel shutoff in the OFF position to stop fuel from flowing to the fuel pump.
- Auxiliary Fuel Pump ..... OFF  
 ☒ Place the auxiliary fuel pump in the OFF position to decrease fuel pressure to the power plant.
- Ignition Switch..... OFF  
 ☒ Turn ignition to the OFF position.
- Master Switches ..... OFF  
 ☒ Place ALT and Battery master switches in the OFF position.
- Cabin Air Vents ..... CLOSED  
 ☒ Close all cabin air vents to reduce amount of smoke that can enter the cabin.
- Emergency Descent..... EXECUTE  
 ☒ Execute an immediate emergency descent at an airspeed not to exceed  $V_{NO}$  of 129 KIAS to attempt blowing out the fire with excessive airflow.
- Forced Landing Checklist..... EXECUTE  
 ☒ Execute the Forced Landing checklist and land as soon as possible.
- Checklist ..... COMPLETE  
 ☒ Verify the Engine Fire In Flight checklist has been completed.

**CABIN FIRE IN FLIGHT**

- Master Switches ..... OFF  
 ☒ Place ALT and Battery master switches in the OFF position.
- All Other Switches (except Ignition)..... OFF  
 ☒ Turn all electrical switches OFF, leaving ignition ON.
- Cabin Heat ..... CLOSED  
 ☒ Close the cabin heat vents to reduce air available to the cabin from the power plant.

- Cabin Air Vents .....CLOSED  
 ⊕ Close the cabin vents to reduce the air available from outside the cabin.
- Fire Extinguisher (If Installed) .....ACTIVATE  
 ⊕ If installed, use the fire extinguisher on the fire, in accordance with operating instructions printed on the side of the extinguisher canister. Take care to avoid aiming the extinguisher at any person in the cabin.
- Cabin Air Vents (After Fire Extinguished) .....OPEN  
 ⊕ If the fire is extinguished, open the cabin air vents to bring in fresh air and begin ventilating the cabin. Even if the fire is not extinguished, it may be necessary to open the vents to bring breathable air to the cabin occupants.
- Windows .....OPEN  
 ⊕ Open windows to further ventilate the cabin.
- Battery Master ..... ON, If Possible  
 ⊕ Turn Battery Master Switch on to enable use of electrical equipment.
- Land ..... AS SOON AS POSSIBLE  
 ⊕ Execute maneuvers as necessary to land the aircraft at a suitable location.
- Checklist.....COMPLETE  
 ⊕ Verify the Cabin Fire In Flight checklist has been completed.

**WARNING**

**If the aircraft is in instrument conditions, turn Battery and ALT Master Switches OFF. If possible, turn the Battery Master Switch ON. Power from the battery will keep the aircraft systems operational long enough to allow the flight crew to execute an immediate diversion.**

**WING FIRE IN FLIGHT**

- Pitot Heat..... OFF  
 ⊕ Place pitot heat switch in the OFF position.
- Navigation Lights ..... OFF  
 ⊕ Turn off navigation lights.
- Strobe Lights ..... OFF  
 ⊕ Turn off wing strobe lights (leave tail beacon on, if possible).

Landing/Taxi Lights ..... OFF

- ⊕ Turn off landing and taxi lights.

Sideslip ..... EXECUTE

- ⊕ Execute a side slip placing the affected wing downwind, and the flames away from the cabin and occupants. Perform as necessary.

Land ..... AS SOON AS POSSIBLE

- ⊕ Any wing fire poses great risk that the flames will weaken the internal wing framing or exterior skin, and/or reach the wing-mounted fuel tank. It is vital that a landing be made, including off airport if necessary, before the flames weaken the wing structure or reach the fuel tank.

Checklist ..... COMPLETE

- ⊕ Verify that the Wing Fire In Flight checklist has been completed.

## **FUEL PRESSURE DROP/LOSS**

Auxiliary Fuel Pump ..... ON

- ⊕ Place the auxiliary fuel pump switch in the ON position to maximize fuel pressure to the power plant.

Fuel Selector ..... BOTH

- ⊕ Place the fuel selector to the BOTH position.

Land ..... AS SOON AS PRACTICABLE

- ⊕ Select and fly to a suitable landing site as soon as practicable. Continue to monitor fuel flow. Execute a normal approach and landing.

Checklist ..... COMPLETE

- ⊕ Verify that the Fuel Pressure Drop/Loss checklist has been completed.

**ALTERNATOR FAILURE**

Alternator Circuit Breaker.....CHECK – IN

- ⊕ Check to ensure ALT circuit breaker is set and has not tripped open.

Ammeter.....CHECK FOR BATTERY DISCHARGE

- ⊕ Check ammeter to determine if the battery is showing a discharge, indicating loss of alternator power output.

If Circuit Breaker IN..... CYCLE ALT SWITCH

- ⊕ If the ALT circuit breaker is in, turn the ALT master switch off, then on again.

If Circuit Breaker OUT (Tripped):

Time .....NOTE

- ⊕ Note the time to determine approximate length of time battery has been providing power. If the alternator cannot be brought back on line, the flight crew should assume a maximum 30 minutes of electrical power remaining.

All Electrical/Master Switches .....OFF 15 SEC

- ⊕ Turn off all electrical, avionics, and master switches for 15 seconds, then reset required switches to the ON position.

ALT Circuit Breaker .....RESET

- ⊕ Attempt to reset the ALT circuit breaker. If the breaker trips a second time, DO NOT attempt a second reset.

If ALT Circuit Breaker Fails to Reset:

- ⊕ Leave circuit breaker in the open (tripped) position. DO NOT attempt to reset or hold the breaker in manually, as this may generate excessive heat and damage to internal components, and fire could result.

Battery Voltage.....CHECK

- ⊕ Check battery remaining voltage. Determine best course of action including diverting to an unplanned destination.

Electrical Load..... REDUCE

- ⊕ Reduce the electrical load as much as possible. External lights and unnecessary navigation/communications equipment can be turned off and circuit breakers pulled. Flight crews are reminded that as available power decreases, radio communication with any ATC facility or other aircraft will become more difficult.

ALT CTL/GRD FAULT Breakers ..... PULL

- ⊕ Pull the ALT CTL and ALT GRD FAULT circuit breakers to prevent unexpected alternator voltage spikes.

Land..... AS SOON AS PRACTICAL

- ⊕ Conduct a normal approach and landing as soon as practicable.

Checklist ..... COMPLETE

- ⊕ Verify the Alternator Failure checklist has been completed.

**LOW VOLTAGE INDICATION**

Ammeter ..... CHECK DISCHARGE

- ⊕ Check ammeter to determine if the battery is showing a discharge, indicating loss of alternator power output.

ALT Circuit Breaker ..... CHECK

- ⊕ Check to ensure ALT circuit breaker is set and has not tripped open.

If Circuit Breaker IN ..... CYCLE ALT SWITCH

- ⊕ If the ALT circuit breaker is in, turn the ALT master switch off, then on again.

Electrical Load ..... REDUCE

- ⊕ Reduce the electrical load as much as possible. External lights and unnecessary navigation/communications equipment can be turned off and circuit breakers pulled. Flight crews are reminded that as available power decreases, radio communication with any ATC facility or other aircraft will become more difficult.

ALT CTL/ALT GRD FAULT Breakers ..... PULL

- ⊕ Pull the ALT CTL and ALT GRD FAULT circuit breakers to prevent unexpected alternator voltage spikes.

ALT Master Switch ..... RECYCLE

- ⊕ Turn the ALT Master Switch off, then on again with the electrical load reduced.

If Voltage Drop Continues:

Land..... AS SOON AS PRACTICAL

- ⊕ Conduct a normal approach and landing as soon as practicable.

Checklist ..... COMPLETE

- ⊕ Verify the Low Voltage Indication checklist has been completed.

**EMERGENCY DESCENT**

Mixture.....RICH

✚ Push mixture control full forward.

Throttle..... IDLE

⊖ Pull throttle control full aft to reduce power during the descent.

Airspeed .....AS REQUIRED

✚ Descend at maximum speed  $V_{NO}$  (129 KIAS), as conditions require and permit.

Checklist.....COMPLETE

⊖ Verify the Emergency Descent checklist has been completed.

**Maximum Glide .....65 KIAS**

<b>NOTE</b>
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Under ideal conditions the Cessna 172 glide ratio is 1.5 nautical miles per 1000' of altitude loss.

## FORCED LANDING

If a Flight Crew has made sufficient attempts to restart the engine and determined that a forced landing is required, immediately survey the area and select a suitable field. Begin preparing for a forced landing.

First, the Flight Crew *must accept that they are going to conduct a forced landing, and that this is a real situation that is happening now.* Doing so in a decisive manner reduces the risk of poor planning and an unsuccessful outcome, and clarifies the tasks at hand. The crew should select the intended landing area as early as possible to maximize available planning time, broadcast their situation and enlist support from ATC or other aircraft, and execute the landing procedure.

If engine power remains available, fly over the intended landing area at a low enough but safe altitude to survey the terrain for obstructions, surface and wind conditions.

If the landing will be conducted on rough or unimproved surfaces, use full flaps if possible to minimize aircraft speed at touchdown. Land on the main gear and hold the nose wheel off the ground as long as possible.

### **WARNING**

**All Bridgewater State College Instructors and students are reminded that in a situation where a forced landing is deemed the only available option, the FIRST AND ONLY PRIORITY IS THE SAFETY AND SURVIVABILITY OF THE OCCUPANTS.**

Airspeed ..... ESTABLISH BEST GLIDE

- ⊕ Establish and maintain best glide airspeed 65 KIAS (Flaps Up).

Mixture ..... IDLE CUTOFF

- ⊕ Pull mixture control full aft to IDLE CUTOFF position, cutting fuel to the power plant.

Fuel Shutoff Valve ..... OFF

- ⊕ Pull fuel shutoff valve knob full OUT to the OFF position.

Radio.....MAYDAY ON CURRENT FREQUENCY OR 121.5

- ⊕ Broadcast: “Mayday-Mayday-Mayday, Tail #, Forced Landing, Location, # of Souls Aboard” on current frequency (Tower, CTAF) or on 121.5, as appropriate. Continue transmitting and listening for a response as long as time permits.

Transponder ..... SQUAWK 7700

- ⊕ Set transponder to 7700 and IDENT.

ELT (If Off Airport)..... ACTIVATE

- ⊕ Engage the remote ELT switch in the upper right corner of the instrument panel.

- All Electrical Switches (Except Master).....OFF  
⊕ Turn off all electrical switches except master switches.
- Flaps .....AS REQUIRED  
⊕ Set flaps as required, preferably full down to minimize landing speed.
- Master Switch ..... OFF WHEN LANDING ASSURED  
⊕ When the landing is assured in the intended area, place the Master Switch in the OFF position.
- Seatbelts/Shoulder Harnesses ..... SECURED  
⊕ Ensure all occupants are secured in their seatbelts and shoulder harnesses.
- Loose Items ..... SECURED  
⊕ Verify that loose items have been secured. This will reduce the risk of injury by any items affected by impact forces during an off-airport landing.
- Doors.....UNLATCH  
⊕ Unlatch and open doors before landing to prevent them from being jammed closed as a result of ground impact.
- Approach to Landing Area .....STABILIZED  
⊕ Establish the aircraft on a stabilized approach to the intended landing area. Avoid distractions, and attempt to land in the most hospitable area available.
- Touchdown..... MINIMUM AIRSPEED  
⊕ Land at minimum airspeed as conditions permit to minimize aircraft groundspeed during the rollout.
- Checklist.....COMPLETE  
⊕ Verify the Forced Landing checklist has been completed.

## **LANDING W/ FLAT MAIN TIRE**

Radio..... TRANSMIT CONDITION/INTENTIONS

- ⊕ Transmit aircraft condition and flight crew intentions to ATC, Tower, CTAF or UNICOM frequency, as appropriate.

Approach..... FLY NORMAL APPROACH

- ⊕ Conduct a normal landing approach. Complete all appropriate checklist items.

Land..... SIDE OF RWY OPPOSITE FLAT TIRE

- ⊕ Land the aircraft on the side of the runway OPPOSITE the flat tire. This will allow for maximum available runway surface during rollout when the aircraft yaws toward the flat tire.

Touchdown ..... GOOD MAIN TIRE FIRST

- ⊕ Touch the good tire down first, then gently lower the flat tire to the runway. Anticipate an immediate yawing motion toward the flat tire.

Directional Control..... MAINTAIN

- ⊕ Use rudder and brake inputs as necessary to keep the aircraft rolling straight ahead on the runway, to the degree possible.

Normal Shutdown ..... EXECUTE, DO NOT TAXI

- ⊕ Once the aircraft comes to a stop, communicate as necessary with Tower, CTAF, or UNICOM frequency, as appropriate. Perform the normal shutdown procedure for the aircraft. Do not attempt to taxi the aircraft on the flat tire.

<b>NOTE</b>
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If a flat tire or tire separation occurs during takeoff and an aborted takeoff is not possible, land as soon as practicable.

## **LANDING W/ FLAT NOSE TIRE**

Radio..... TRANSMIT CONDITION/INTENTIONS

- ⊕ Transmit aircraft condition and flight crew intentions to ATC, Tower, CTAF or UNICOM frequency, as appropriate.

Approach..... FLY NORMAL APPROACH

- ⊕ Conduct a normal landing approach. Complete all appropriate checklist items.

Land..... CENTER OF RWY

- ⊕ Land on runway centerline to maximize available runway surface.

Touchdown..... SOFT-FIELD TECHNIQUE

- ✦ Execute a soft-field landing technique, landing gently on the main wheels and holding the nose wheel off the runway for as long as possible, lowering it gently as groundspeed decreases.

Directional Control ..... MAINTAIN

- ✦ Use rudder and brake inputs as necessary to keep the aircraft rolling straight ahead on the runway, to the degree possible.

Normal Shutdown..... EXECUTE, DO NOT TAXI

- ⦿ Once the aircraft comes to a stop, communicate as necessary with Tower, CTAF, or UNICOM frequency, as appropriate. Perform the normal shutdown procedure for the aircraft. Do not attempt to taxi the aircraft on the flat tire.

## **DITCHING**

If a Flight Crew has determined that a forced landing/ditching is required, immediately survey the area and select a suitable area in the water. Begin preparing for a ditching.

As with a forced landing on land, the Flight Crew *must first accept that they are going to conduct a forced landing in the water, and that this is a real situation that is happening now.* Doing so in a decisive manner reduces the risk of poor planning and an unsuccessful outcome, and clarifies the tasks at hand. A successful water ditching depends on sea conditions and wind, the type of aircraft, and the skill/technique of the pilot.

The Aeronautical Information Manual highlights the following as important for any flight crew planning to ditch the aircraft:

- ⊕ It is vital to determine the condition of the water, and remember that the direction of the swells may not follow the direction of the wind. Landing into the wind without consideration of swell direction or directions (with multiple swell systems) greatly increases the risk of aircraft damage and loss of the occupants.
- ⊕ Flight crews should avoid landing on the “face” of a swell, which is the side facing the observer regardless of swell direction. Doing so in a high-wing aircraft may result in the aircraft being rapidly swamped or thrown into the air, only to drop into the next swell.

The crew should select the intended landing area as early as possible (only about 500’ will be necessary when landing in the water) to maximize available planning time, broadcast their situation and enlist support from ATC or other aircraft, and execute the landing procedure.

If engine power remains available, fly over the intended landing area at a low enough but safe altitude to survey the sea surface and wind conditions.

- ⊕ If landing parallel to the swells, there is little difference whether the aircraft lands on top of the crest or in the trough. Attempt to land at the top or on the backside of the swell, and select the heading that allows the greatest into-the-wind component.
- ⊕ If landing in a confused sea (multiple swell systems moving in various directions) select the direction of the primary swell as the determining factor, and attempt to land on the backside of the secondary swell, if possible.
- ⊕ If power is not available, conduct the approach so as to arrive over the water with enough airspeed to break the glide earlier and more gradually before the aircraft touches down.
- ⊕ Once the pilot sees a stretch of water that appears favorable, cut power or, if power is not available, pitch up slightly to induce the stall and touch down at the best recommended speed as fully stalled as possible.

**WARNING**

**“The use of power in ditching is so important that when it is certain that the coast cannot be reached, the pilot should, if possible, ditch before fuel is exhausted.”**

**AIM 6-3-3 Ditching Procedures**

Radio ..... MAYDAY ON CURRENT FREQUENCY OR 121.5

- ✦ Broadcast: “Mayday-Mayday-Mayday, Tail #, Ditching, Location (include body of water and land reference), # of Souls Aboard” on current frequency (Approach, Tower, etc.) or on 121.5, as appropriate. Continue transmitting and listening for a response as long as time permits.

Transponder ..... SQUAWK 7700

- ✦ Set transponder to 7700 and IDENT.

Loose Objects ..... SECURE, KEEP EXITS CLEAR

- ✦ Secure loose objects to prevent their becoming projectiles when the aircraft impacts the water. Objects must be kept clear of the exit doors.

Seatbelts/Shoulder Harnesses ..... SECURE

- ✦ Ensure all occupants are secured in their seatbelts and shoulder harnesses.

Doors/Windows ..... UNLATCH

- ✦ Unlatch and open doors and windows before landing to prevent them from being jammed closed as a result of water impact.

Flaps ..... FULL DOWN, if possible

- ✦ Set flaps as required, preferably full down to minimize landing speed.

ELT ..... ACTIVATE

- ✦ Engage the remote ELT switch in the upper right corner of the instrument panel.

Descent ..... 300 ft/min @ 55 KIAS

- ✦ Establish a stabilized descent to approach the water surface. During the descent, note water condition and begin planning the landing approach.

Approach ..... PARALLEL SWELLS (If Possible)

- ✦ Set approach in accordance with sea direction and swell height/type. Accept a higher crosswind component and avoid flying approach into a swell system if possible.

Touchdown ..... LANDING ATTITUDE @ MIN AIRSPEED

- ✦ Set attitude according to sea, not horizon, and land at minimum recommended airspeed as close as possible to a full stall.

Aircraft.....EVACUATE

- ⊕ Release seatbelts/shoulder harnesses and evacuate the aircraft immediately.

Life Vests/Raft (If Installed)..... INFLATE

- ⊕ If installed, life vests/raft shall be donned and inflated by the occupants as soon as possible after they have exited the aircraft.

<b>NOTE</b>
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The above ditching procedures have not been demonstrated in the aircraft.

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