X. AREA OF OPERATION: EMERGENCY OPERATIONS

A. TASK: EMERGENCY APPROACH AND LANDING (SIMULATED)

1. Exhibits knowledge of the elements related to emergency approach and landing procedures.

Emergency Approaches /Engine Failures

If you lose your engine on takeoff and don't have enough runway to set the airplane back down.
Make sure you don't try and turn back to the runway you just departed from.
Also make sure you get the nose of the airplane down to prevent a stall from occurring.
If you lose your engine while at altitude follow the procedures below.

1)First establish the best glide speed **attitude**, and trim the airplane to hold this. Although this is a very important aspect of this emergency you don't want to spend a lot of time setting this up. A good way to help complete this in a timely manner is to hold the nose of the airplane on the horizon or just below and set the trim to a predetermined spot that you know from practicing this maneuver.

2) **Pick your Zone** Find a good spot to land and head toward that spot and stay over it using a spiraling technique.

3) If time allows and you have completed the first two steps, then attempt a restart of the airplane using the procedures in the checklist.

Notes: If you don't have time to use the manufacturers checklist, just remember that the most common causes of engine failure in flight are carburetor icing and fuel starvation. The manufacturers checklist will usually point to the items that have to do with either one of these reasons, such as carburetor heat, fuel selector, mixture, etc.

4) Aim for the middle of the field you have chosen to land in. You want to make sure you make the field and don't end up short. The picture below describes this reasoning if a worst case should happen and you misjudge your touchdown.

5) Once you have definitely made your field of choice. Add Flaps and try and use as much of the beginning of the field as possible.

2. Analyzes the situation and selects an appropriate course of action.
3. Establishes and maintains the recommended best-glide airspeed, ±10 knots.
4. Selects a suitable landing area.
5. Plans and follows a flight pattern to the selected landing area considering altitude, wind, terrain, and obstructions.
6. Prepares for landing, or go-around, as specified by the examiner.
7. Follows the appropriate checklist.

B. TASK: SYSTEMS AND EQUIPMENT MALFUNCTIONS

Objective. To determine that the applicant:
1. Exhibits knowledge of the elements related to system and equipment malfunctions appropriate to the airplane provided for the practical test.
2. Analyzes the situation and takes appropriate action for simulated emergencies appropriate to the airplane provided for the practical test for at least three (3) of the following—
a. partial or complete power loss.

Partial or Complete Power Loss /Engine Roughness

Mixture	rich
Alternate air	open
Fuel shut off	open
Fuel pump	on
Ignition switch	cycle l/ r/ both
Throttle at	present position
Establish Best glide speed	73
climb if power allows	
Select best place to land	

Engine failure cruise

Best glide cruise flaps	73 kts
Pick your field	
Mixture	rich
Throttle	full
Alt air	open
Fuel shutoff	open

Ignition switch cycle L/R/ both
Aim for end of first third of runway

Restarting the Engine w/Propeller Windmilling
*Do not engage starter w/prop windmilling. Serious engine damage can result
.

- a Sensenich propeller will continue to windmill as long as airspeed is at least 60 KIAS
- Airspeed 73
- Mixture rich
- Fuel shutoff open
- Ignition switch both
- Fuel pump on
- Fuel prime on
- Throttle 3/4 in forward
- Check
- Oil press
- Temp Fuel Prime off
- Gen/Bat on

b. engine roughness or overheat.
c. carburetor or induction icing.
d. loss of oil pressure.

Loss of Oil Pressure
If this condition occurs, check the oil temperature and act based on the following

Temperature increasing

- Engine failure is probably imminent
  1) Reduce engine power
  2) Select sutible place to land

Temperature normal
Possibly oil pressure gauge or relief valve is malfunctioning. Not necessarily cause for alarm. Land as soon as practical and have it checked.
Possible the oil pressure gauge or relief valve is malfunctioning. Not necessarily cause for alarm. Land as soon as practical and have it checked

e. fuel starvation.
f. electrical malfunction.

Electrical malfunction

Excessive Rate of Charge

- Normal after right startup, while the battery is being recharged by the alternator
- If excessive for too long, the battery could overheat and cause problems with the electrical components.
- An over-voltage sensor may take the alternator off-line. You can reactivate the alternator if this happens and check that everything is back to normal. Either way you should minimize the electrical equipment you use for the flight and get the system checked.

Insufficient Rate of Charge

- The alternator isn't supplying enough power to the system • Turn off all nonessential equipment and terminate flight as soon as practical

g. vacuum/pressure, and associated flight instruments malfunction.

vacuum/pressure, associated flight instruments malfunction

- Works the way a water wheel works. Air is drawn over rotor vanes of a gyro by a vacuum pump that is run by the engine. • The amount of vacuum pressure required is usually between 4.5 to 5.5 in Hg. • Normally only the Attitude Indicator and Heading Indicator are run from the vacuum system.

Pitot/Static system

- Reads changes and differences in air pressure and through mechanical linkage, displays this information to the following instruments:

1) **Airspeed Indicator** – measures the difference in air pressure between the Ram Air pressure measured from the Pitot tube

and the Static pressure measured from the Static Port

2) **Altimeter** – measures the changes in air pressure through the static port as altitude is increased and decreased.
3) **Vertical Speed Indicator** – measures the changes in air pressure through the static port as altitude is increased and decreased. The difference between this instrument and the altimeter is that the VSI displays the difference in air pressure between the diaphragm and the sealed case located in the diaphragm. Even though both take pressure readings from the same static port. The air in the diaphragm is allowed to change instantly with changes in outside air pressure while the air in the sealed case isn't allowed to change instantly due to a calibrated leak.

- Clogged static

Clogged pitot tube

h. pitot/static.

i. landing gear or flap malfunction.

Flap malfunction

- Flaps should be checked for proper operation during the pre-flight check
- If the flaps won't retract after takeoff, either while performing short or soft-field takeoffs, or while performing touch and go's or go-arounds.

Land if there is enough runway available to ensure a safe landing. If there isn't enough runway, continue your climb, paying attention to obstacles and maintain airspeed. Return for landing without trying to adjust the flaps any further.

j. inoperative trim.

- **Inoperative Trim**
- Trim should be checked for proper operation during the pre-flight check
- If you have a trim problem while in flight and are able to control the airplane without it, then discontinue use and land as soon as possible to get it checked. Further use of the trim having problems could aggravate the situation.

k. inadvertent door or window opening.

Inadvertent door or window opening

- Checking that the doors and windows are properly secured should be done before takeoff.
- Although this can be an unsettling situation, it rarely causes a problem with maintain aircraft control of the aircraft.
- Never try to close the door or window while on takeoff or landing.
- Continue to fly a normal approach and close the door or window after landing.

l. structural icing.

Structural icing

- **Getting out of icing conditions**
  - Make a 180 degree turn back to where you were before ice started to accumulate
  - Ice layers are usually thin layers of altitude and climbing or descending to a different altitude may get you out of it.
  - Climb first; if you don't get to an altitude without icing, you will be coming down anyway to the lower altitude.
  - If you descend first and don't get out if the ice by going to a lower altitude, you won't be able to climb to a higher altitude.
- The airplane must be in visible moisture for structural ice to form. This can be clouds, snow, freezing rain, etc.
- Structural ice affects performance in two ways, it adds weight and decreases lift performance.
- If you have frost on the airplane prior to flight, you must remove all of it before flying.

m. smoke/fire/engine compartment fire.

Engine fire on start

- Usually caused by excessive priming, and after a backfire
- Continue to crank the engine trying to get the airplane to start, which will suck the flames and accumulated fuel through the carburetor and into the engine.
- After letting the airplane run for a few seconds, shut it down and have the airplane inspected for damage.
- Whereas it is hard to see the flames under the cowling from the pilots seat, you can open your door and look for the reflection through the door window. 3) Repeat sequence.

Fire in flight

- The type and smell of smoke can be used to determine if it is an electrical fire or a fuel/oil fire.
- Turn off heaters and electrical equipment
- Open doors and windows if you need to remove smoke from the cabin

- The principle concern of engine fire is structural damage to the aircraft.

Fuel/Oil Fire

- Smoke will be black and smell like burning oil
- An emergency descent should be executed as soon as possible to find an airspeed that will blow the fire out and get you to a low altitude for landing as soon as possible.
- Slip away from the fire for better visual
- If an engine fire, determine if the current flight situation would allow for you to cut the engine off.
- If in VFR with good landing spots, then you may want to turn the engine off
- If in IMC over mountainous terrain then you may not want to turn the engine off.

Electrical Fire

- Smoke will be white and probably the smell of burning wire insulation
- If electrical equipment is required for the flight (if navigating in IMC conditions), turn the electrical equipment on one component at a time to try and determine the cause.

n. any other emergency appropriate to the airplane.

Lost Communication

While flying VFR in Class E and G airspace

- Stay out of areas where you are required to communicate with ATC (Class A, B, C, D airspace). Find a place to land when practical and troubleshoot from the ground.

While trying to land at an airport with a control tower

1) Determine the direction of the traffic pattern. You can do this by circling the field above the pattern altitude.
2) Enter the traffic pattern using a standard 45 entry
3) Fly a normal traffic pattern and watch the tower for light signals.

Where you are required to communicate to ATC

- 1) Squawk 7700 for 1 minute
- 2) Squawk 7600 for 15 minutes

Troubleshooting your Radio

1) Determine if it is just a radio problem or an entire electrical problem. This can be done easily by checking the Low Voltage light to see if it is illuminated and checking to see if your other electrical equipment is working correctly.
2) If it is just a radio communication problem then check the following:
   b) Radio Circuit Breakers – CHECK
   c) Radio On/Off switch – CHECK on, turn up volume
   d) Test/Squelch – PULL and TURN (listen for static)
   e) Audio Panel Transmitter Selector Switch – CHANGE to other radio
   f) Audio Panel COM 1 and COM 2 buttons – PUSH on
   g) Microphone Plug – CHECK secure

h) Frequency – CHANGE to a different frequency

any other emergency appropriate to the airplane

3. Follows the appropriate checklist or procedure.

C. TASK: EMERGENCY EQUIPMENT AND SURVIVAL GEAR(ASEL and ASES)

REFERENCES: FAA-H-8083-3; POH/AFM.

Objective. To determine that the applicant:

Exhibits knowledge of the elements related to emergency equipmentand survival gear appropriate to the airplane and environment

encountered during flight. Identifies appropriate equipment thatshould be aboard the airplane.

- There is no requirement by regulations that you have survival gear on board the airplane while flying but some basics should be considered, especially when flying cross-country.
- Basic survival equipment should include: First aid kit, knife, flashlight, water, matches, additional clothing, signaling devices, and a handheld transceiver or cell phone.

XI. AREA OF OPERATION: NIGHT OPERATION

TASK: NIGHT PREPARATION

Objective. To determine that the applicant exhibits knowledge of the elements related to night operations by explaining:

1. Physiological aspects of night flying as it relates to vision.

- **Retina**—contains many photosensitive cells called cones and rods which are connected to the optic nerve.
- **Cones**—function well in bright light and are sensitive to colors
- **Rods**—are 10,000 times more sensitive to light than the cones, and are much of your peripheral vision.

Night Vision

- Most effective way to look for traffic during night flight is to scan slowly, to permit off-center viewing. Look to the side of an object for the clearest focus.
- A steady red light and a flashing red light ahead and at the same altitude. The other aircraft is crossing to the left.
- To adapt the eyes for night flying, avoid bright white lights for at least 30 minutes before the flight
- Position light from SS to SR

Notes:

- It takes about 30 minutes for the rods to become adapted to the night and have maximum night vision
- A pilot should avoid bright light after your eyes have become adjusted to the night **Terms:**

Retina

- A layer upon which all images are focused

Cones

- Located in the center of the retina
- Detect color, details, and faraway objects
- Function best during the day, with lots of light. • Give you visibility straight ahead

Rods

- Located around the cones, not the center of the retina
- Used for peripheral vision
- Make night vision possible • Allow for off center viewing

Increasing Night Vision effectiveness:

- Force yourself to view off center
- Close one eye if you become exposed to bright light
- Move your eyes slowly

Illusions

Visual Auto kinesis

Cause: occurs when a pilot stares at a single light source for several seconds on a dark night.
Result: the light will appear to be moving
Remedy: don't become fixed on one source of light

Black hole approach

Cause: when landing over water or non-lighted terrain where the runway lights are the only source of light
Result: the pilot has a hard time orienting to earth. The runways can seem out of position (downsloping or upsloping).
Remedy: Use navigation aids if possible

Bright Runway and approach lighting systems

Result: fly a higher than normal approach
Remedy: becoming familiar with the airfield layout

2. Lighting systems identifying airports, runways, taxiways and obstructions, and pilot controlled lighting.

Runway Lighting

- The different types of runway lighting are:
- Runway End Identifier Lights (REIL)
- Runway Edge Lights

- In-Runway Lighting
- Pilot controlled lighting is controlled by the pilot by tuning into the CTAF (Common Traffic Advisory Frequency) for the airport and keying the mike a set number of times as listed below.

Runway End Identifier Lights (REIL)

- Provide rapid and positive identification of the approach end of a particular runway.
- Consists of a pair of synchronized flashing lights located laterally on each side of the runway threshold.

Runway Edge Lights

- Outline the edges of runways at night or during low visibility conditions.
- Classified according to their intensity: High (HIRL), Medium (MIRL), Low (LIRL). The High and Medium are variable intensity settings.
- The lights are white except on instrument runways where amber lights are used on the last 2,000 feet or half the length of the runway, whichever is less.

In-Runway Lighting

- Some precision runways have Touchdown Zone Lights (TDZL), runway center lights (RCLS), and taxiway turnoff lights

Airport Lighting:

- **Beacon**
  - White and Green identifies a lighted land airport
  - Yellow and White identifies a sea base airport
  - Green, Yellow, and White identifies a heiloport
  - Green and dual-peaked white identifies a military airfield.
  - When an airports beacon is on during the daytime, it usually means that the weather is below basic VFR minimums (ceiling less than 1000 ft and/or visibility is less than 3 miles.
- **Pilot-Controlled Lighting2- 1-7**
  - 7 clicks of the microphone in 5 seconds will set the lights on high intensity
  - 5 is medium, 3 is low; lights will stay on for 15 minutes.
  - **Taxiway lights2-1-9**Are blue with green centerline lights.
- **Visual Glideslope indicators2-1-2**
  - Pilot should fly at or above the glide path when approaching an airport with a VASI.
  - VASI provides safe obstruction clearance within plus or minus 10 degrees of the extended runway centerline and to 4 NM from the runway threshold.
  - Precision Approach Path Indicator (PAPI); Tri-color; Pulsating

Visual Glideslope Indicators

The main two types that will be discussed here are the

- VASI (Visual Approach Slope Indicator)

Show you a 3 degree glidepath, and whether you are above it or below it.

- PAPI (Precision Approach Path Indicator)
  - Shows the following:
    - High (more than 3.5 degrees)
    - Slightly High (3.2 degrees)
    - On the glidepath (3 degrees)
    - Slightly Low (2.8 degrees)
    -Low (less than 2.5 degrees)

3. Airplane lighting systems.

Airplane

- Anti-collision light system including a flashing or rotating beacon and position lights
- Landing light if the airplane is used for hire

4. Personal equipment essential for night flight.

Equipment

Pilot

- flashlight with spare batteries and white and red lenses
- Aeronautical charts

5. Night orientation, navigation, and chart reading techniques.

Pre-Flight

• Check all lights are operational
• Examine parking ramp for chocks or other obstructions, not easily noticeable at night

Starting, Taxiing, and Run-up

• Turn rotating beacon on before engine startup
• When using lights to taxi take into consideration other pilots
• Keep the lights as dim as you can for better night vision effectiveness

Takeoff and Climb

• Ensure a positive rate of climb with the VSI since the night makes it difficult to note whether the airplane is getting closer or farther from the surface

Approaches and Landings

• Use heading bug to set to the runway number for better orientation
• Never fly a low approach
• Turn landing light on approx. half-way down the final approach
• Start round out when you can see the tire marks on the runway (with landing light)
• Start roundout when the runway lights at the far end of the runway appear to rise higher than the nose of the airplane (without landing light)

6. Safety precautions and emergencies unique to night flying.

Night

- The definition of nighttime is the time between the end of evening civil twilight and the beginning of morning civil twilight.

XII. AREA OF OPERATION: POSTFLIGHT PROCEDURES

A. TASK: AFTER LANDING, PARKING, AND SECURING

1. Exhibits knowledge of the elements related to after landing, parking and securing procedures.
2. Maintains directional control after touchdown while decelerating to an appropriate speed.
3. Observes runway hold lines and other surface control markings and lighting.
4. Parks in an appropriate area, considering the safety of nearby persons and property.
5. Follows the appropriate procedure for engine shutdown.
6. Completes the appropriate checklist.
7. Conducts an appropriate postflight inspection and secures the aircraft.

After Landing

• Don't focus on performing the after landing checks to where you compromise control of the airplane

There are two arguments for retracting flaps or not after landing.

Pros

- retracting flaps helps with brake effectiveness allowing you to stop in a shorter distance.
- Its also more sure footed with head/crosswind.

Cons

- Inadvertent gear retraction

Parking

- Evaluate the area where you are parking, paying attention to prop blast, other aircraft or vehicles, and people.
- Make sure the nosewheel is straight before shutting down the engine.
- **Securing SMMM Switches, mixture, mags & master.**
- Always follow the manufacturers checklist for the shutdown.
- Most checklists follow the Acronym.

SLIM.

- **S**witches (radio, lights, transponder, etc)
- **L**ean (pull the mixture to cutoff)
- **I**gnition (turn the key to off)
- **M**aster switch (turn the Master switch to off)
- Make sure everyone stays in their seats until the engine has completely been shutdown
- Chock or tiedown the aircraft, especially in high wind conditions.