Piper Cherokee-Series

Aircraft Systems & Emergencies Review
Flying 20 Club Aircraft

- **N8107B – 1979 Piper Dakota**
  - 235HP Lycoming O-540-J3A5D
    - 6 cylinder normally-aspirated
    - 2400RPM maximum

- **N455H – 2000 Piper Archer III**
  - 180HP Lycoming O-360-A4M
    - 4 cylinder normally-aspirated
    - 2700RPM maximum

- **N8237B – 1980 Piper Archer II**
  - 180HP Lycoming O-360-A4M
    - 4 cylinder normally-aspirated
    - 2700RPM maximum for 5 minutes
    - 2650RPM maximum continuous
Outline

- Piper PA-28 Series Overview
  - Systems Review
    - Cockpit Layout
      - 455H Overhead Switches
    - Pitot-Static System
    - Vacuum System
    - Electrical System
    - Fuel System
    - Brake System
    - Control System
    - Heating & Ventilation
    - Exterior
      - Tires
    - Weight & Balance

- Break

- Emergencies
  - Carb Icing
  - Pitot-Static Problems
  - Vacuum Failure
  - Electrical Problems
  - Engine Problems
  - Carbon Monoxide
  - Control System Failures
    - Flight Controls
    - Brakes
  - Miscellaneous
Piper PA-28 “Cherokee” Series Overview

- All metal, semi-monocoque structure
  - The skin provides part of the structural strength
    - 0.051” (1.3mm) – 0.016” (0.4mm) thick
- Wings are of a full cantilever design with removable tips

PA-28(R)(T)-###(T)
- PA – Piper Aircraft
- 28(R)(T) – Series ID
  - R = Retractable gear
  - T = T-tail
- ### – Horsepower
  - ##0/5 = “Hershey bar” wing
  - ##1/6 = Semi-tapered wing
  - ####T = Turbo-charged engine
Flying 20 Club’s Piper PA-28 Models

- **Piper Dakota (PA-28-236)**
  - ATC Type: P28B
  - Oil capacity
    - 12 QT oil capacity
    - 2 ¾ QT minimum
    - Recommend 9 QT minimum

- **Piper Archer (PA-28-181)**
  - ATC Type: P28A
  - Oil capacity
    - 8 QT oil capacity
    - 2 QT minimum
    - Recommend 6 QT minimum
  - Not uncommon for there to be a slight hesitation/stumble when advancing the throttle through ~1000-1500 RPM
  - All 3 have a Tanis engine heater
Understanding the aircraft systems can save your life!
Know where all the switches and circuit breakers are by feel.
Cockpit Layout – N8107B (Cont.)

- Know where all the switches and circuit breakers are by feel
Cockpit Layout – N8237B

- Know where all the switches and circuit breakers are by feel
Cockpit Layout – N8237B (Cont.)

- Know where all the switches and circuit breakers are by feel

Backup Vacuum

Alt. Avionics Master
Cockpit Layout – N455H

- Know where all the switches and circuit breakers are by feel

- Electric Pitch Trim
- CO Detector
- Auto-Pilot Alt. Pre-selector
- Backup Vacuum
- Digital EGT/CHT
- Digital Volt/Ammeter
- ELT
- WX Clear
- Suction Gauge
- LASAR Fault Light
- Alternate Static Air
- Panel Lighting
- Carb Ice Detector
Cockpit Layout – 455H Overhead Switches

- Know where all the switches and circuit breakers are by feel

- Magneto Switches
- Electric Primer & Starter Buttons
- Position Lights
- No Beacon light - use Strobes
- Magneto Switches
The pitot and static lines should be drained prior to each flight
- Not included on most checklists!
- The ASI, altimeter, and VSI static lines are plumbed in parallel.
Pitot-Static System – Dual Static Ports

- Benefits of the dual static-port configuration
  - Less likely that both will become obstructed
  - More accurate during a slip

NOTE: 07B & 55H have separate (dual) static ports
Pitot-Static System - Components

- Heated pitot-static vane
- No external pitot drain
  - Cabin pitot-static drain valves must be opened prior to each flight
- 455H & 8107B: Separate dual static ports

Images:
- Ram air pitot
- Static port / drain
- Static port
- Dual static port (1 of 2)
Pitot-Static System - Continued

Alternate Static Air

Using alternate static air

<table>
<thead>
<tr>
<th>Storm window and vents</th>
<th>CLOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabin heater and defroster</td>
<td>FULL ON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airspeed Indicator</td>
<td>Reads higher</td>
</tr>
<tr>
<td>Altimeter</td>
<td>Reads higher (error &lt;50’)</td>
</tr>
<tr>
<td>Vertical Speed Indicator</td>
<td>Momentary climb</td>
</tr>
</tbody>
</table>

Using alternate static air:
- Storm window and vents: CLOSED
- Cabin heater and defroster: FULL ON
Vacuum System

- Normal vacuum range: 4.5” – 5.5” at cruise RPM.
- The vacuum warning light will illuminate when the differential pressure is less than 3.5” hg.
- At low RPMs (such as during taxiing or idling), the vacuum light may come on.
- This is normal, and momentarily raising the RPMs should clear the light.
The alternator warning light will illuminate when the alternator output drops to zero.

8237B & 8107B
- 14V system
- 12V battery
- 60A alternator

455H
- 28V system
- 24V battery
- 70A alternator
- The “low bus voltage” light will illuminate when the voltage drops to 24.5v or less.
Fuel System

- One fuel sump and vent per tank, one main fuel strainer sump
- 455H & 8237B
  - Two 25 gallon tanks, 24 gallons usable
  - 17 gallons usable at tabs
  - 50 gallons total, 48 gallons usable
  - 455H
    - Electric primer
  - 8237B
    - Manual primer
- 8107B
  - Two 38.5 gallon tanks, 36 gallons usable
  - 25 gallons usable at tabs
  - 77 gallons total, 72 gallons usable
  - Manual primer
- The carburetor is attached below the oil cooler on Piper Lycomings, so you’re essentially always running with partial carb heat.
Brake System

- One master brake fluid reservoir
- Hand brake, and left & right toe brakes all have separate brake cylinders
  - The hand brake is incorporated into the master brake cylinder
- Pilot and Co-pilot brake pedals are plumbed in series
Brake System - Detail

Brake fluid from the master brake reservoir feeds into the left and right toe brakes through the co-pilot’s side.

From master brake reservoir

Left toe brake lines

Right toe brake lines

1. SPRING CUP
2. TOE BRAKE PEDAL
3. ARM, TRIM CONTROL ATTACHMENT
4. CLEVIS PIN, WASHER & COTTER PIN
5. CLEVIS ASSEMBLY
6. CLEVIS PIN
7. ARM, IDLER
8. JAM NUT
9. CLEVIS PIN, WASHER & COTTER PIN
10. CLEVIS PIN, WASHER & COTTER PIN
11. SPRING, RETURN
12. BRACKET
13. BRACE ASSEMBLY
14. CYLINDER ASSEMBLY, HYDRAULIC
15. TUBE ASSEMBLY, LEFT
16. CLEVIS PIN & COTTER PIN
17. HOSE ASSEMBLY - FLEXIBLE
18. TUBE ASSEMBLY, RIGHT
Control System – Aileron

- Diagram is of a Cessna 172, but the Piper PA-28 system is very similar

- Always check for proper control movement on both sides!
- There have been cases of ailerons being mis-rigged

<table>
<thead>
<tr>
<th>Yoke</th>
<th>LEFT aileron</th>
<th>RIGHT aileron</th>
</tr>
</thead>
<tbody>
<tr>
<td>To the LEFT</td>
<td>UP</td>
<td>DOWN</td>
</tr>
<tr>
<td>To the RIGHT</td>
<td>DOWN</td>
<td>UP</td>
</tr>
</tbody>
</table>
Control System – Aileron, Continued

- **What to check for during pre-flight**
  - Is the control wheel level when both ailerons are neutral?
    - If not, indicates a rigging issue
  - Do both ailerons move in the proper direction?
    - And do they move freely?
  - Do you get full aileron deflection in both directions?
    - If not, this also indicates a rigging issue
  - Are there any bulges in the ailerons?
    - Bulges could mean the aileron was used to push the plane forward, and will cause an out-of-trim condition during flight
  - Are there any cracks in the aileron skin?
  - Is there excessive free play in the ailerons (without a resulting deflection in the control wheel)?
    - Too much (>0.24 “) could indicate low cable tension, among other things
Control System – Rudder

- Diagram is of a Cessna 172, but the Piper PA-28 system is very similar

- Cessna nose gear connected via bungees
- Piper nose gear connected directly to rudder pedals

Note, separate cable to actuate left and right movement
Control System – Rudder, Continued

- What to check for during pre-flight
  - Are the rudder pedals neutral when the rudder is streamlined?
    - If not, indicates a rigging issue
    - This may be difficult to check for – nose gear might not be in neutral position, based on how the aircraft is parked
  - Rudder travel and operation can’t be tested during the walk-around (unlike a Cessna)
    - Is there excessive free play in the rudder?
  - Are there any bulges or cracks in the rudder or rudder skin?
    - Since the nose gear is directly connected to the rudder, excessive nose gear shimmy could cause damage
Control System – Stabilator

- Diagram is of a Cessna 172, but the Piper PA-28’s rigging is very similar
  - NOTE: Stabilator and anti-servo tab are rigged separately

Trim tab cables

Control cables

Note, separate cable to actuate up and down movement
What to check for during preflight

- Does the stabilator and tab move in the proper direction?
  - Trim tab is an “anti-servo tab”, and moves in the same direction of the stabilator’s movement
- Do you get full stabilator deflection in both directions?
- Is there excessive free play in the trim tab?
  - Maximum of 0.15 “
- Does the trim tab cabling look worn or frayed, or not evenly wrapped around the trim barrel?
- Does movement of the trim wheel move the trim tab?
  - And does it move freely, or is there excessive resistance?
Control System – Empennage

- Empennage access panel (rear of baggage compartment)
Two main things to note

1. Left and right flap are directly linked together
   - Virtually no chance of a split-flap condition
2. Flap operation
   - Flaps are indirectly pulled UP by spring tension
   - Flaps are directly pulled DOWN by the flap handle

Due to aerodynamic forces, you might not be able to retract flaps during a spin, with icing, or in other situations outside of the normal operating envelope
   - Always stay within the operating envelope!
   - Flaps may also remain stuck down if the spring breaks
Airflow is regulated between front and rear seats by levers

Air is exhausted by an outlet under the rear seats

Heater and defroster
  - Ram-air: ineffective until you are moving
  - Heat comes from a muffler shroud
    - Cracks in muffler could lead to CO poisoning
Fresh air gets ducted from the engine baffle, to the heater muff on the muffler.
Heating & Ventilation – Close Up (Cont.)
Heating & Ventilation – Heat Diversion

Push **forward** to divert heat to the **front** seat

Push **reward** to divert heat to the **back** seat

Front seat heat opening: OPEN

Front seat heat opening: CLOSED
Exterior

VOR / Glideslope

ELT

VHF Communications
Exterior – Part 2

GPS Receivers

Transponder
Exterior – Part 3

- VHF Communications
- Marker Beacon Receiver
- Strike-finder
Exterior – Part 4

- Battery Vent/Drain
- Aircraft Jack Point
- Fuel Tank Vent
- Wing Fuel Sump
As an aircraft moves through the air, it builds up a static charge. Eventually, the charge differential will become large enough that it will discharge into the air.

- This discharge causes electromagnetic interference that will be picked up in the radios as loud static.

- The static discharge wicks help control the static build-up, and greatly reduces the electromagnetic interference from static discharges.
Tires & Landing Gear

Question – What is more stressful for the tires: takeoff or landing?
• Consider what the tires go through for takeoff versus landing
  • **Landing:** Sudden acceleration to touchdown speed, then continual deceleration and slow taxiing
  • **Takeoff:** Taxiing for takeoff (especially at a large airport) builds up heat in the tires, and then continual acceleration during takeoff
• Answer: both are stressful events

- **Over-inflation**
  - Can cause uneven tread wear
  - Reduced traction
  - Tread more susceptible to cutting
  - Increased stress on aircraft wheels

- **Under-inflation**
  - Uneven tire wear
  - Greatly increases stress and flex heating in the tire
    - Shortens tire life
    - Can lead to tire blowouts

- **Proper inflation values**
  - 455H & 8237B
    - Nose gear: 18psi
    - Main gear: 24psi
  - 8107B
    - Nose gear: 28-30psi
    - Main gear: 35-40psi

- **Proper strut extension**
  - Nose gear: 3.25” +/- 0.25”
  - Main gear: 4.5” +/- 0.50”
Weight & Balance

- Empty Weight
  - Aircraft Weight
  - Un-drainable oil & fuel

Density Altitude – Just because you’re within the weight & balance, doesn’t mean you’re necessarily safe!
Emergencies
Carb Icing

- Be aware of the potential for carb icing
  - When is carb icing more of a threat: the winter or the summer?
    - Answer: More likely in the summer, but potentially more serious in the winter
    - But there’s the potential for it nearly year-round
  - See more with AC 20-113, Lycoming SI 1148C

- ALWAYS use full carb heat!
  - Don’t use partial heat: ice could reform in the intake system
  - Partial heat is only acceptable with a carb temperature gauge

- During run-up, note a 100-300 RPM drop with carb heat applied
  - If engine roughness and/or RPM increase, indicates potential carb icing

- Detecting carb ice
  - Fixed-pitch (37B, 55H)
    - Unexplained decrease in RPM
  - Constant-speed (07B)
    - Unexplained decrease in MP

- If carb ice is suspected,
  1. Apply carb heat
  2. Wait for a decrease in engine roughness and/or increase in RPM
  3. [Piper POH] If no change after about one minute, turn carb heat off
     - i.e. Additional troubleshooting required

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Pitot-Static Problems

- Know specific power settings that give a known airspeed
- Pitot-heat is anti-ice; turn on before entering visible moisture when close to freezing temperatures
### Pitot-Static Problems - Continued

<table>
<thead>
<tr>
<th>Pitot Port</th>
<th>Static Port</th>
<th>Flight Attitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLOCKED</td>
<td>CLEAR</td>
<td>Climbing</td>
<td>ASI increasing</td>
</tr>
<tr>
<td>BLOCKED</td>
<td>BLOCKED</td>
<td>Level</td>
<td>ASI frozen</td>
</tr>
<tr>
<td>BLOCKED</td>
<td>BLOCKED</td>
<td>Descending</td>
<td>ASI &amp; Alt. Frozen, VSI 0</td>
</tr>
<tr>
<td>CLEAR</td>
<td>BLOCKED</td>
<td>Climbing</td>
<td>ASI decreasing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level</td>
<td>ASI correct</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Descending</td>
<td>ASI increasing</td>
</tr>
</tbody>
</table>

**Activate pitot heat**

**Use Alt. Static Air**
Pitot-Static Problems – Discussion

- How would you know if you have a static port blockage?
  - Would ATC know? Why, or why not?
  - You make a pitch and/or power change and don’t get the expected indication
  - Use and cross-check with GPS altitude
  - What about occasionally switching to alternate air?
    - If your altitude is way off, it may damage the altimeter

- How would you know if you have a pitot port blockage?
  - Would ATC know? Why, or why not?
    - Would they necessarily tell you?
  - You make a pitch and/or power change and don’t get the expected indication
  - Use and cross-check with GPS airspeed
    - Remember, GPS is ground speed, not air speed
Pitot-Static Problems – Examples

- **Vertical Speed Indicator**
  - Pointer not at zero when level
    - Aging diaphragm / zero rate-of-climb out of adjustment
  - Pointer doesn’t respond
    - Obstruction in static line
    - Static vents frozen over
    - Water in static line
  - Pointer oscillates
    - Leak in static lines
    - Possibly defective instrument
  - Rate of climb changes reading when airplane is banked
    - Water in static line
  - Rate of climb reads very low during (obvious) climb or descent
    - Instrument case broken or leaking

- **Airspeed Indicator**
  - Airspeed oscillates
    - Instrument defective
  - Airspeed reads high
    - Instrument defective
    - Leak in static lines
  - Airspeed reads low
    - Instrument defective
    - Leak in static lines
    - Pitot head incorrectly aligned

- **Altimeter**
  - Excessive scale error or oscillations
    - Instrument defective
  - Setting knob hard to turn
    - Instrument defective
  - Altimeter stuck / doesn’t change with altitude
    - Water or restriction in static line
  - Altimeter changes reading when airplane is banked
    - Water in static line
Vacuum Failure

- If instrument rated, be sure to include the vacuum gauge in your scan
  - Know where it is on the instrument panel

- Affected systems
  - Attitude Indicator
  - Directional Gyro

- Know what your backups are
  - Turn Coordinator – electrically-powered gyro
  - All 3 Flying 20 Club planes have a backup electrical Attitude Indicator

- Backup vacuum pump
  - 8237B & 455H
    - Monitor electrical load when turned on
Electrical Problems

What systems are powered by the electrical system?

- Attitude instruments
  - Turn Coordinator
  - Electric Attitude Indicator
    - 455H's electric AI does not have a backup battery
  - Vacuum gauge
- Navigation equipment
  - VOR/LOC/GPS
  - Transponder
- Autopilot
  - Electric pitch trim
- Radios
- Engine instruments
  - Fuel level
  - Fuel pressure
  - Oil pressure & temperature
  - EGT/CHT/OAT
    - 455H still uses an analog OAT
- Volt/ammeter…obviously
- 8107B
  - Tachometer
  - Fuel flow
- Lights
  - Interior
  - Exterior
- Other
  - CO detector
  - Cabin fan
  - Electric fuel pump
  - Clock
  - 455H
    - Carb ice detector
    - LASAR ignition
    - Electric vacuum pump
  - Hobbs meter
    - The one good thing!
Electrical Problems - Continued

- Know the layout of the circuit breaker panels
- Know which circuit breakers can be pulled

- Pitch trim
- Landing Lights
- M3 GPS
- Auto-pilot

All can be pulled
### Electrical Problems - Troubleshooting

- Never reset a circuit breaker more than **once**!
- If the battery is dead, getting an external power start is not recommended
  - The battery’s capacity is very low, and may not provide power very long if the alternator fails

<table>
<thead>
<tr>
<th>Zero-reading on ammeter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify reading isn’t simply low by turning on electrical equipment</td>
<td></td>
</tr>
<tr>
<td>Check for a popped alternator field circuit breaker</td>
<td></td>
</tr>
<tr>
<td>Reset overvoltage relay (cycle ALT switch)</td>
<td></td>
</tr>
<tr>
<td>Reduce electrical load and land as soon as practical</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical overload</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>“Stuck” starter</td>
<td>Starter is acting as a generator; electrical equipment may not function properly</td>
</tr>
<tr>
<td>Possibly a low battery</td>
<td>Indication should decrease within 5 minutes</td>
</tr>
<tr>
<td>Turn BAT switch off, and monitor ammeter</td>
<td>Indication should decrease within 5 minutes</td>
</tr>
<tr>
<td>Turn ALT switch off</td>
<td></td>
</tr>
<tr>
<td>Reduce electrical load and land as soon as practical</td>
<td></td>
</tr>
</tbody>
</table>
Engine Problems

- Three types of problems
  1. Complete power loss
  2. Partial power loss
  3. Pending potential problem

- Three phases of flight
  1. During takeoff
     1. Before obtaining a safe altitude
     2. After obtaining a safe altitude
  2. Cruise
  3. Descent & Approach

- The type of problem you have, and the phase of flight that it occurs, will determine which steps you should take.

- Above all else, maintain a safe airspeed!
  - If doing so means having to do a controlled crash, so be it – better to crash land under control, than to stall/spin into the ground
    - Nearly all low-altitude stall/spin crashes are fatal!
    - But controlled crash landings have much more favorable outcomes

- When you have an engine problem, “think FAST”
  - Fuel – Fuel pump, switch tanks
  - Air – Carb Heat / Alternate Air
  - Spark – Magnetos
  - Trim - For best glide
Complete Engine Power Loss
- During takeoff, before safe altitude
  - Maintain safe airspeed
  - Use flaps as necessary
  - Make only shallow turns
- During takeoff, after safe altitude / During descent and approach
  - Switch fuel tanks
  - Verify mixture rich, fuel pump on, and primer is locked
  - Carb heat on
  - Try left or right magneto separately
  - Adjust mixture and/or throttle
- During cruise
  - Check engine instruments for indication of cause of power loss
Partial Engine Power Loss
- Generally, the same steps as before, except less time critical
  - Aviate, Aviate, Aviate
  - THEN Navigate (and Communicate)

Engine Roughness / Partial Power Loss
- Carb heat on
  - [Piper POH] If still rough after one minute, carb heat off
- Adjust mixture for maximum smoothness
  - Even at the same altitude, you may need to occasionally re-lean due to different air densities (“high to low, lookout below”, etc)
- Fuel pump on
  1. In order to switch tanks
  2. In case of engine-driven fuel pump failure
- Switch tanks
  - Fuel tank may be empty (or nearly empty)
  - Fuel may be contaminated
  - There may be a block in the fuel line to that tank
  - The fuel vent may be blocked
- Try left or right magnetos separately
  - If operation satisfactory, continue at reduced power, mixture full rich, and land at first practical airport
Engine Problems – Indications

- **Loss of oil pressure**
  - Faulty gauge
    - Most likely if oil temperature doesn’t also increase
  - Malfunction in oil pressure regulating system
  - Oil leak
  - Land as soon as possible
    - If engine still running, maintain altitude in case of a sudden engine stoppage
  - The low oil pressure light will illuminate when the oil pressure drops below 35psi.

- **High oil pressure**
  - Faulty gauge
    - Malfunction in oil pressure regulating system
  - Land as soon as possible
    - High oil pressure can damage the engine seals

- **Low oil temperature**
  - Engine not pre-heated enough
  - Winterizer plate not installed during cold weather
  - Faulty gauge
  - Most likely to happen on the ground – shut engine down and investigate the cause

- **High oil temperature**
  - Low oil level
  - Obstruction in oil cooler
  - Winterizer plate still installed during warm weather
  - Damaged/improper baffle seals
  - Faulty gauge
  - Climb at a higher airspeed or level off
  - Increase mixture
  - Reduce throttle
  - If temperature continues to rise, land as soon as possible
Engine Problems – Indications (2)

- Excessively high CHT
  - Use of a lower fuel grade than 100 octane
  - Extremely high manifold pressure with low RPM
  - High power setting with an excessively lean mixture
  - Extended ground operation or steep climbs in which cylinder cooling is reduced
  - Climb at a higher airspeed or level off
  - Increase mixture
  - Reduce throttle
  - If temperature continues to rise, land as soon as possible

- Low fuel pressure
  - Faulty gauge
  - Fuel system blockage
  - Engine-drive pump failure
  - Low fuel
  - Boost pump on
  - Switch tanks
Excessive engine vibration (other than engine roughness)
- Could be a propeller out of balance
  - If imbalance is severe enough, it could cause the engine to be pulled off the engine mount
    - If this happens, recovery is likely impossible due to the severe weight & balance imbalance
- Could also be a more serious engine problem

Engine fire
- During start
  - Mixture to idle cutoff
  - Open throttle & continue cranking engine
    - This is to attempt to draw the fire back into the engine
  - If fire continues for more than a few seconds, extinguish it by the best external means
- In flight
  - Fuel selector off
  - Throttle closed
  - Mixture to idle cutoff
  - Electric fuel pump off
  - Heater & defroster off
Carbon Monoxide

- Effects are cumulative over time; even small concentrations over time can be hazardous
- Altitude intensifies the effects
- Smoking also intensifies the effect
  - Smoking is roughly equivalent to a 5000’ altitude

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 ppm (0.0035%)</td>
<td>Headache &amp; dizziness within 6-8 hours of constant exposure</td>
</tr>
<tr>
<td>200 ppm (0.02%)</td>
<td>Slight headache, fatigue, and nausea within 2-3 hours</td>
</tr>
<tr>
<td>400 ppm (0.04%)</td>
<td>Headache within 1-2 hours</td>
</tr>
<tr>
<td>800 ppm (0.08%)</td>
<td>Dizziness, nausea, and convulsions within 45 minutes</td>
</tr>
<tr>
<td>1600 ppm (0.16%)</td>
<td>Headache, dizziness, and nausea within 20 minutes; death in less than 2 hours</td>
</tr>
<tr>
<td>3200 ppm (0.32%)</td>
<td>Headache, dizziness, and nausea within 5-10 minutes; death within 1 hour</td>
</tr>
<tr>
<td>6400 ppm (0.64%)</td>
<td>Death within 25 minutes</td>
</tr>
<tr>
<td>12800 ppm (1.28%)</td>
<td>Death in less than 3 minutes</td>
</tr>
</tbody>
</table>
Carbon Monoxide – CO Alerts

- All three Flying 20 Club aircraft have the same CO detector installed, BUT they are located differently on the panel; know where to look!
  - Alert is triggered when the CO level > 50ppm
- What to do if you get an alert
  - First of all, don’t assume it’s a false alarm!
    - False alarms are possible, but the alert must be treated as valid
    - ONE reset of the system is permissible
  - Shut off the heater and defroster
  - Open fresh-air vents and storm window
  - Descending will reduce the effects of altitude and might buy you needed time
  - Land as soon as practicable
    - Declare an emergency if necessary
Control System Failures

- **Broken throttle cable**
  - Adjust power using the mixture control

- **Broken stabilator cable**
  - Trim for stable, level flight, until ready to land
  - Plan for a no-flap landing
    - Reduces the pitch variations required

- **Can’t raise nose**
  - Apply substantial nose-up trim
    - Push *forward* to pitch down, *release pressure* to pitch up

- **Can’t lower nose**
  - Apply substantial nose-down trim
    - Pull *aft* to pitch up, *release pressure* to pitch down

- **Jammed rudder**
  - Airplane will generally be flyable, but in a slip
    - Keep this in mind as you make any configuration changes
      - Airspeed may be erroneous
      - Unnecessary maneuvering could cause a stall/spin
Control System Failures – Brakes

- **Signs of impending brake failure**
  - Gradual decrease in braking action after brake application
  - Noisy or dragging brakes
  - Soft or spongy pedals
  - Excessive travel and weak braking action

- **Dealing with brake failure**
  - Throttle to idle
  - Full aft elevator (to aide in aerodynamic braking)
  - If spongy brakes or pedal travel increases
    - Attempt to pump the brakes to build up brake pressure
  - If one brake is weak or fails
    - Use the other brake sparingly, using opposite rudder as required
### Miscellaneous

- **Seat slides back on takeoff or landing**
  - **DO NOT** grab the yoke!
    - Be sure to inform your passengers (especially non-pilots) in the pre-flight briefing

- **Sick passenger (airsick or otherwise)**
  - What would you do? VFR, IFR

- **Runaway pitch trim**
  - What would you do?
    - Disconnect autopilot
      - Yoke disconnect
      - Autopilot master switch
      - Pull circuit-breaker
    - Disable electric pitch trim
      - Electric pitch trim master switch
      - Pull circuit-breaker
    - Turn off avionics master switch

  - Turn off master switch
  - Autopilot (including pitch trim) servos are designed to be overpowered
  - There is also a speed sensor that disables the electric trim over 140 KIAS

- **Propeller over-speed**
  - 455H & 8237B
    - Reduce throttle
      - Stay below 2700 RPM
    - Reduce airspeed
  - 8107B
    - Reduce throttle
      - Stay below 2400 RPM
    - Check oil pressure
    - Reduce prop control
    - Reduce airspeed
Miscellaneous - Continued

- **Spins (unintentional)**
  - Exact steps vary from plane to plane – read the POH
    1. Throttle to idle
    2. Ailerons neutral
    3. FULL opposite rudder
      1. Followed by control wheel full forward
    4. Neutralize rudder after rotation stops and smoothly regain level flight
      1. Airspeed will build rapidly, so return to level flight needs to be quick, but smooth so as not to overstress the airframe

- **Open door**
  - Such a common occurrence that is a non-issue, but frequently causes unnecessary accidents
    - Remember, the doors are double-latched, so it’s unlikely it is completely unlatched
    - AVIATE, then determine best course of action
      - Nearly impossible to close the door yourself, but if it’s only partially unlatched, it *may* be possible for a passenger to attempt to close the door
      - Otherwise, consider landing as soon as possible and closing on the ground
More Information

- **AFM or POH**
  - Archer II: 761-722
  - Archer III: 761-868
  - Dakota: 761-689

- **Operator’s Manual**
  - Lycoming O-360: 60297-12
  - Lycoming O-540

- **Airplane Maintenance Manual**

- **Type Certificate**
  - Aircraft
    - Piper PA-28
  - Engine
    - Lycoming O-360
    - Lycoming O-540
  - Propeller
    - Sensenich 76E-series
    - Hartzell F2YR-series

- Pilot’s Handbook of Aeronautical Knowledge (FAA-H-8083-25A)

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