

# Piper Archer III (PA-28-181)

- ★ 1. Oil ..... (5-6 Qt Normal, 8 Max) ..... Add oil when <5 Qt, Verify Cap is Secure

## CABIN PREFLIGHT

- |  |                         |
|--|-------------------------|
| 1. POH & Documents .....               | In Copilot Seatback     |
| 2. Magneto Switches .....              | L & R OFF               |
| 3. Pitot/Static Drains .....           | Push to Drain           |
| 4. Avionics/Electrical Switches .....  | OFF                     |
| 5. Master Switch .....                 | ON                      |
| 6. Engine Temperatures .....           | CHT/Oil Temp $\geq$ 40F |
| 7. Fuel Gauges .....                   | Verify Accurate         |
| 8. Pitot Heat & Light Switches .....   | ON; Verify Operation    |
| 9. Stall Warning Horn .....            | Verify Operation        |
| 10. Pitot Heat & Light Switches .....  | OFF                     |
| 11. Annunciator Day/Night Switch ..... | Set as Appropriate      |
| 12. Annunciator Panel .....            | PRESS TO TEST           |
| 13. Hobbs & Tachometer .....           | Record                  |
| 14. Master Switch .....                | OFF                     |
| 15. Flaps .....                        | Full DOWN (3)           |

## WALKAROUND

### Right Wing

- |   |                       |
|---|-----------------------|
| 1. Flap & Aileron .....                     | Skin & Hinges Normal  |
| 2. Wing Surfaces .....                      | No Contamination      |
| ★ 3. Wing Tie Down & Chock .....            | Removed               |
| 4. Fuel Vent .....                          | Unobstructed          |
| 5. Fuel Drain ..... Sample Clean .....      | No Leaks              |
| ★ 6. Fuel Tank ..... Quantity Verified .... | Cap Secure            |
| 7. Main Gear Strut .....                    | 4.25"-4.75" extension |
| 8. Tire & Brakes .....                      | 24-27 psi, No Leaks   |

### Nose

- |                                 |                     |
|---------------------------------|---------------------|
| 1. Cowling .....                | Secure              |
| 2. Prop & Spinner .....         | Good Condition      |
| ★ 3. Engine Cooling Inlet ..... | Unobstructed        |
| 4. Air Filter Inlet .....       | Unobstructed        |
| 5. Nose Wheel Strut .....       | 3.0"-3.5" extension |
| 6. Nose Wheel Tire .....        | 18-20 psi           |
| ★ 7. Nose Wheel Chock .....     | Removed             |
| 8. Main Fuel Strainer .....     | L & R Sample Clean  |

# Piper Archer III (PA-28-181)

## Left Wing

- |      |                                       |                       |
|------|---------------------------------------|-----------------------|
| 1.   | Leading Edge .....                    | No Contamination      |
| 2.   | Main Gear Strut .....                 | 4.25"-4.75" extension |
| 3.   | Tire & Brakes .....                   | 24-27 psi, No Leaks   |
| ★ 4. | <b>Wing Tie Down / Chock .....</b>    | <b>Removed</b>        |
| 5.   | Fuel Vent .....                       | Unobstructed          |
| 6.   | Fuel Drain ..... Sample Clean .....   | No Leaks              |
| ★ 7. | Fuel Tank ..... Quantity Verified ... | Cap Secure            |
| ★ 8. | Pitot/Static Mast .....               | (3) Openings Clear    |
| 9.   | Flap & Aileron .....                  | Skin & Hinges Normal  |

## Fuselage

- |      |                            |                      |
|------|----------------------------|----------------------|
| 1.   | Empennage .....            | No Contamination     |
| 2.   | Left Static Port .....     | (2) Openings Clear   |
| ★ 3. | <b>Tail Tie Down .....</b> | <b>Removed</b>       |
| 4.   | Rudder & Stabilator .....  | Skin & Hinges Normal |
| 5.   | Right Static Port .....    | (2) Openings Clear   |
| ★ 6. | Baggage Door .....         | Closed & Latched     |

## BEFORE ENGINE START

- |    |                           |                   |
|----|---------------------------|-------------------|
| 1. | Flaps .....               | RETRACTED (0)     |
| 2. | Parking Brake .....       | Set               |
| 3. | Seats & Belts .....       | Adjusted & Secure |
| 4. | <b>PASSENGER BRIEFING</b> |                   |

- No Smoking
- Turn cell phones OFF or activate "airplane" mode
- Seatbelts must be worn during taxi, takeoff, & landing
- **Explain door operation**
- Sterile cockpit during taxi, takeoff, and landing
- Fire extinguisher location
- Help point out other nearby air traffic

- |    |                                    |                   |
|----|------------------------------------|-------------------|
| 5. | Circuit Breakers .....             | Check Closed      |
| 6. | Avionics/Electrical Switches ..... | OFF               |
| 7. | Carb Heat .....                    | COLD (off)        |
| 8. | Fuel Selector .....                | Lowest/RIGHT Tank |
| 9. | Display Backup Switch .....        | AUTO              |

# Piper Archer III (PA-28-181)

## ENGINE START

- |   |                     |  |
|---|---------------------|--|
| 1. Throttle .....                         | OPEN .....          | 1/2" hot, 1/4" cold                      |
| 2. Mixture .....                          |                     | FULL RICH                                |
| 3. Master & Alternator Switches .....     |                     | ON                                       |
| 4. Engine Monitor .....                   |                     | Fuel Quantity SET,<br>MAIN PAGE selected |
| 5. Strobe Lights (and Nav if night) ..... |                     | ON                                       |
| 6. Fuel Pump .....                        |                     | ON                                       |
| 7. Primer Switch .....                    |                     | HOLD for 2-4 seconds                     |
| 8. Prop Area .....                        |                     | Clear                                    |
| 9. LEFT Magneto Switch .....              |                     | ON                                       |
| 10. Starter .....                         |                     | Engage                                   |
| 11. RIGHT Magneto Switch .....            |                     | ON                                       |
| 12. Throttle .....                        |                     | 800-1200 RPM                             |
| 13. Oil Pressure .....                    | Within 30 Sec ..... | 25 psi minimum                           |
| 14. Fuel Selector .....                   |                     | Fullest/LEFT Tank                        |
| 15. Fuel Pump .....                       |                     | OFF                                      |
| 16. Mixture .....                         |                     | LEANED (Max RPM)                         |

## BEFORE TAXI

- |                               |  |                       |
|-------------------------------|--|-----------------------|
| 1. Fuel Quantity .....        |  | Sufficient for flight |
| 2. Avionics Master .....      |  | ON                    |
| 3. Transponder .....          |  | Code & Mode Set       |
| 4. Nav/GPS/Radios .....       |  | Programmed & Set      |
| 5. ADI/HSI Crew Profile ..... |  | Load Desired Profile  |
| 6. Elevator Trim .....        |  | Set to NEUTRAL        |
| 7. Flight Controls .....      |  | Free and Correct      |

## ENGINE RUNUP

- |                        |  |                     |
|------------------------|--|---------------------|
| 1. Parking Brake ..... |  | Set – Guard w/ Feet |
| 2. Seats & Belts ..... |  | Check Secured       |
| 3. FLIGHT INSTRUMENTS  |  |                     |

- |                      |  |                       |
|----------------------|--|-----------------------|
| a. A.H. ....         |  | Level                 |
| b. Altimeter .....   |  | Baro Set; +/- 75 feet |
| c. VSI .....         |  | Check Zero            |
| d. Heading .....     |  | Aligned & Bug Set     |
| e. Turn & Bank ..... |  | No Flags              |

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- |                             |   |
|-----------------------------|---|
| 4. Mixture .....            | <b>RICH / leaned &gt;5000'</b>              |
| 5. Throttle .....           | 2000 RPM                                    |
| a. Oil Pressure .....       | <b>In the Green</b>                         |
| b. Magneto Check .....      | 10-170 RPM Drop,<br>< 50 RPM Difference     |
| c. Ammeter .....            | <b>Check w/ Load</b>                        |
| d. Carb Ice Detector .....  | ON & sensitivity set                        |
| e. Carb Heat .....          | ON w/ RPM Drop                              |
| f. Throttle .....           | IDLE  |
| g. Carb Heat .....          | <b>COLD w/ RPM Rise</b>                     |
| 6. Throttle .....           | 1000-1200 RPM                               |
| 7. ADI & HSI Check .....    | Review messages, No yellow/red battery icon |
| 8. Departure Briefing ..... | Completed (see p. 7)                        |
- Check THAT Setup (Transponder, Heading, Altimeter, Talk)**

## TAKEOFF

- |                              |                  |
|------------------------------|------------------|
| ★ 1. Doors .....             | Closed & Latched |
| 2. All Exterior Lights ..... | ON [Lights]      |
| 3. Transponder .....         | ALT [Camera]     |
| 4. Fuel Pump .....           | ON [Action]      |
| 5. Timer .....               | Start            |

### NORMAL:

- |                             |                            |
|-----------------------------|----------------------------|
| 1. Flaps .....              | RETRACTED (0)              |
| 2. Throttle .....           | FULL OPEN                  |
| 3. Engine Instruments ..... | <b>Verify in the green</b> |
| 4. Rotate .....             | 60 KIAS                    |

### SHORT FIELD, OBSTACLE CLEARANCE:

- |                            |                            |
|----------------------------|----------------------------|
| 1. Flaps .....             | 25-degrees (2)             |
| 2. Brakes .....            | Hold                       |
| 3. Throttle .....          | FULL OPEN                  |
| 4. Engine Instruments..... | <b>Verify in the green</b> |
| 5. Brakes .....            | RELEASE @ full power       |
| 6. Rotate .....            | 55 Kts, accel to 60        |
| 7. Flaps .....             | Retract After 64 Kts       |

- Climb Speed ..... to 1000' AGL .....  $V_y$  (76 KIAS)

# Piper Archer III (PA-28-181)

## ENROUTE CLIMB

1. Airspeed ..... 87 KIAS
2. Throttle ..... FULL OPEN

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3. Landing Light ..... OFF abv 3000' AGL
4. Mixture ..... LEAN abv 5000' MSL

## CRUISE

1. Fuel Pump ..... OFF
2. Fuel Pressure ..... **Verify in the green**

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3. Power ..... 75% or less
4. Trim ..... Adjusted
5. Mixture ..... LEAN as required

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## BEFORE LANDING (~12 nm / IAF)

1. ATIS & Altimeter ..... Current & Set [WIR]
2. Landing Light ..... ON
3. Seats & Belts ..... Secured

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4. Fuel Selector ..... **Fullest Tank** [E]
5. Approach Procedures ..... Reviewed

# Piper Archer III (PA-28-181)

## LANDING (Pattern / FAF)

- |                    |      |     |
|--------------------|------|-----|
| 1. Fuel Pump ..... | ON   | [G] |
| 2. Mixture .....   | RICH | [M] |

### PATTERN:

- |                   |                        |
|-------------------|------------------------|
| 1. Downwind ..... | 90 Kts (Flaps 10° - 1) |
| 2. Base .....     | 75 Kts (Flaps 25° - 2) |
| 3. Final .....    | 66 Kts (Flaps 40° - 3) |

### SHORT FIELD (AFTER TOUCHDOWN):

- |                       |               |
|-----------------------|---------------|
| 4. Brakes .....       | Max as Needed |
| 5. Flaps .....        | RETRACTED (o) |
| 6. Control Yoke ..... | Full Aft      |

## AFTER LANDING

- |                        |                |
|------------------------|----------------|
| 1. Fuel Pump .....     | OFF            |
| 2. Landing Light ..... | OFF            |
| 3. Carb Heat .....     | COLD (off)     |
| 4. Flaps .....         | RETRACTED (o)  |
| 5. Elevator Trim ..... | Set to NEUTRAL |

## SHUTDOWN

- |                                       |                     |
|---------------------------------------|---------------------|
| 1. Parking Brake .....                | As Needed           |
| 2. Throttle .....                     | IDLE                |
| 3. Avionics/Electrical Switches       |                     |
| a. Avionics .....                     | OFF                 |
| b. Strobe Lights .....                | ON until prop stops |
| 4. Mixture .....                      | IDLE CUTOFF         |
| 5. Magneto Switches .....             | OFF                 |
| 6. Tach time .....                    | Recorded            |
| 7. Exterior Lights .....              | OFF                 |
| 8. Master & Alternator Switches ..... | OFF                 |
| 9. Cabin Overhead Light .....         | OFF                 |
| 10. ADI & HSI power .....             | OFF                 |
| 11. Flight Plan .....                 | Closed              |

# Piper Archer III (PA-28-181)

## COMMUNICATION

|            |        |                       |        |
|------------|--------|-----------------------|--------|
| DXR ATIS   | 127.75 | Flight Services       | 122.20 |
| DXR Ground | 121.60 | Air-to-air            | 122.75 |
| DXR Tower  | 119.40 | Helicopter Air-to-air | 123.02 |

## V-SPEEDS

|                                      |          |              |         |
|--------------------------------------|----------|--------------|---------|
| $V_x$                                | 64 KIAS  | $V_s$        | 50 KIAS |
| $V_y$                                | 76 KIAS  | $V_{so}$     | 45 KIAS |
| $V_{fe}$                             | 102 KIAS | 1.3 $V_{so}$ | 59 KIAS |
| $V_a - 2500$ lbs                     | 113 KIAS | $V_{app}$    | 66 KIAS |
| $V_a - 1634$ lbs                     | 89 KIAS  |              |         |
| $V_{no}$                             | 125 KIAS |              |         |
| $V_{ne}$                             | 154 KIAS |              |         |
| Max Demonstrated Crosswind – 17 KIAS |          | $V_g$        | 76 KIAS |

## USABLE FUEL

|                                                                                                            |                              |                       |
|------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------|
| <b>2 @ tabs:</b> 34 gal                                                                                    | <b>1 tab, 1 full:</b> 41 gal | <b>2 full:</b> 48 gal |
| <ul style="list-style-type: none"> <li>Add 1 gal per side (2 gal total) for total fuel capacity</li> </ul> |                              |                       |

## OIL OPERATING RANGES

|                       | Idle        | Normal    | Max     |
|-----------------------|-------------|-----------|---------|
| Operating Pressures   | 25-55 PSI   | 55-95 PSI | 115 PSI |
| Operating Temperature | 180 – 210 F |           |         |

## Departure Briefing

- Takeoff Abort Point ..... 50 Kts before 50% takeoff roll
- Safety Altitude ..... At least 1000' AGL
- Initial Departure Heading .... Review
- Initial Departure Altitude .... Review

## Abbreviations

|                                 |                                               |
|---------------------------------|-----------------------------------------------|
| WIRE                            | Weather, Instruments, Radios, Everything else |
| G <sub>U</sub> M <sub>P</sub> S | Gas, Mixture, Switches                        |
| GAS                             | Gas, Air, Spark                               |

# Piper Archer III (PA-28-181)

## Lycoming O-360-A4M, 180HP @ 2700 RPM

| Pressure Alt. | Std. Temp C/F | 55%               | 65%               | 70%  | 75%  |
|---------------|---------------|-------------------|-------------------|------|------|
| 0             | 15/59         | 2265              | 2405              | 2460 | 2515 |
| 1000          | 13/55         | 2270              | 2415              | 2470 | 2530 |
| 2000          | 11/52         | 2280              | 2425              | 2485 | 2545 |
| 3000          | 9/48          | 2290              | 2440              | 2500 | 2560 |
| 4000          | 7/45          | 2300              | 2450              | 2510 | 2575 |
| 5000          | 5/41          | 2310              | 2460              | 2525 | 2590 |
| 6000          | 3/37          | 2320              | 2470              | 2535 | 2605 |
| 7000          | 1/34          | 2330              | 2480              | 2550 | 2625 |
| 8000          | -1/30         | 2340              | 2495              | 2565 |      |
| 9000          | -3/27         | 2350              | 2505              | 2575 |      |
| 10000         | -5/23         | 2360              | 2515              |      |      |
| 11000         | -7/19         | 2370 <sup>1</sup> | 2525 <sup>1</sup> |      |      |
| 12000         | -9/16         | 2380 <sup>1</sup> | 2535 <sup>1</sup> |      |      |

**RPM Adjustments**      Each + 6C/11F      +10 RPM  
                                          Each - 6C/11F      -10 RPM

### Fuel Flow (GPH)

| % Power | Best Power (100F ROP) | Best Economy (Peak EGT) |
|---------|-----------------------|-------------------------|
| 55      | N/A                   | 8.0                     |
| 65      | 9.5                   | N/A                     |
| 70      | 11.5                  | N/A                     |
| 75      | 13.5                  | N/A                     |

- RPM values estimated.
  - Max cruise CHT < 400F
  - Max climb CHT < 420F



## ENGINE FAILURE

### TAKEOFF RUN

1. Throttle ..... IDLE
2. Brakes ..... Maximum Effort
3. *If Insufficient Runway Remaining:*
  - a. Mixture ..... IDLE CUTOFF
  - b. Master Switch ..... OFF
  - c. Magneto Switches ..... L & R OFF
  - d. Fuel Selector ..... OFF

### IMMEDIATELY AFTER TAKEOFF

1. Airspeed ..... V<sub>g</sub> - 76 KIAS
2. Mixture ..... IDLE CUTOFF
3. Master Switch ..... OFF
4. Magneto Switches ..... OFF
5. Fuel Selector ..... OFF
6. Flaps ..... As Required
7. Cabin Door ..... Unlatched & Opened
8. Land ..... Straight Ahead

### DURING FLIGHT (Restart Procedure)

1. Airspeed ..... V<sub>g</sub> - 76 KIAS
2. Mixture ..... RICH
3. Fuel Pump ..... ON [G]
4. Fuel Selector ..... Switch tanks
5. Carb Heat ..... ON [A]
6. Magneto Switches ..... Try LEFT, RIGHT [S]
7. *If no restart, see FORCED LANDINGS on pages 12 & 13*

## ENGINE PROBLEMS

### LOSS OF FUEL PRESSURE

1. Fuel Pump ..... ON
2. Fuel Selector ..... Select fullest tank
3. Fuel Pressure Indicator ..... Cross-check fuel flow
4. *If fuel flow is abnormal AND/OR loss of power is experienced:*
  - a. **LAND AS SOON AS PRACTICAL**

# Piper Archer III (PA-28-181)

## LOW OIL PRESSURE / HIGH OIL TEMPERATURE

1. Throttle ..... Minimum Power
2. **LAND AS SOON AS PRACTICAL**

## HIGH (>430F) CHT

1. Mixture ..... RICH
2. Airspeed ..... 90+ KIAS
3. Throttle ..... Reduce Power

## ENGINE ROUGHNESS / LOSS OF POWER

1. Carb Heat ..... FULL ON
2. *If problem continues after 2 minutes:*
  - a. Fuel Pump ..... ON
  - b. Mixture ..... Adjust [G]
  - c. Fuel Selector ..... Switch Tanks
  - d. Carb Heat ..... OFF [A]
  - e. Magneto Switches ..... Try LEFT, RIGHT [S]
  - f. *If problem continues:* **LAND AS SOON AS PRACTICAL**

## FIRES

### ENGINE FIRE – DURING START

1. Starter ..... Continue cranking
2. Mixture ..... IDLE CUTOFF
3. Throttle ..... FULL OPEN
4. Fuel Pump ..... OFF
5. Fuel Selector ..... OFF
6. Engine ..... Secure
7. Avionics/Electrical Systems ..... OFF
8. Fire ..... Extinguish

### ENGINE FIRE – DURING FLIGHT

1. Mixture ..... IDLE CUTOFF
2. Fuel Pump ..... OFF
3. Fuel Selector ..... OFF
4. Heater & Defroster ..... OFF
5. **LAND AS SOON AS POSSIBLE**

## ELECTRICAL FIRE

1. **Master & Alternator Switches** ..... OFF
2. **Vents, Cabin Air, Heat** ..... Closed
3. **Fire Extinguisher** ..... Use As Necessary
4. **Avionics/Electrical Switches** ..... OFF
5. If fire appears out & electrical equipment necessary:
  - a. **Master Switch** ..... ON
  - b. **Circuit Breakers** ..... Check, Don't Reset
  - c. **Avionics / Electrical Switches** .... ON, one at a time

## ELECTRICAL PROBLEMS

### ALTERNATOR FAILURE

1. **Alternator Switch** ..... OFF
2. **Alternator Circuit Breakers** ..... Check Closed
3. **Alternator Switch** ..... ON
4. If alternator still inoperative:
  - a. Follow **ELECTRICAL OVERLOAD** Checklist Below

### ELECTRICAL OVERLOAD



1. **Electrical Load** ..... Reduce
2. If loads are not reduced:
  - a. **Alternator** ..... OFF
  - b. **Flight** ..... Terminate ASAP

## MISCELLANEOUS

### CO ALERT

1. **Cabin Heater/Defroster** ..... OFF
2. **Storm Window** ..... Open
3. **Cabin Vents** ..... Open Fully
4. If alert doesn't stop after 2 minutes:
  - a. **Altitude** ..... Lowest Safe Altitude
  - b. **LAND AS SOON AS PRACTICAL**

### LOSS OF PRIMARY ADI

1. **Standby HSI**..... Verify on ADI Page  
If manual reversion required: Display Backup Switch ..... ON

# Piper Archer III (PA-28-181)

## OPEN DOOR

- With Passenger:
  1. Airspeed ..... Slow to 87 KIAS
  2. Cabin Vents ..... Open
  3. Storm Window ..... Open
  4. If side latch open:
    - a. Pull on armrest to close door
    - b. Move handle to latched position

If upper latch open:

    - a. Pull on armrest to close door

If both latches open:

    - a. Latch side latch, then upper latch
- Without Passenger:
  1. Land when practical

## ICING CONDITIONS

1. Pitot Heat ..... ON
2. Carb Heat ..... FULL ON
3. *Maintain airspeed – stall speed may be greatly increased!*
4. **Exit icing conditions as soon as possible!**

## FORCED LANDINGS

### LANDING WITHOUT POWER

1. Airspeed .....  $V_g$  - 76 KIAS
2. Seats, Belts, Harnesses ..... Secured
3. Mixture ..... IDLE CUTOFF
4. Master Switch ..... OFF
5. Magneto Switches ..... OFF
6. Fuel Selector ..... OFF
7. Flaps ..... As Required
8. If time permits:
  - a. Transponder ..... 7700
  - b. Radio ..... Mayday (121.5)
9. Prior to touchdown:
  - a. Cabin Door ..... Unlatched & Opened

# Piper Archer III (PA-28-181)

## PRECAUTIONARY LANDING WITH POWER

1. **Airspeed** ..... **V<sub>g</sub> - 76 KIAS**
2. Seats, Belts, Harnesses ..... Secured
3. Landing Site ..... Overfly, noting conditions

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4. If time permits:
  - a. Transponder ..... 7700
  - b. Radio ..... Mayday (121.5)
5. When landing is assured:
  - a. **Mixture** ..... **IDLE CUTOFF**
  - b. **Master Switch** ..... **OFF**
  - c. Magneto Switches ..... OFF
  - d. **Fuel Selector** ..... **OFF**
  - e. Flaps ..... As Required

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6. Prior to touchdown:
  - a. **Cabin Door** ..... **Unlatched & Opened**

## DITCHING (WITH OR WITHOUT POWER)

1. **Airspeed** ..... **V<sub>g</sub> - 76 KIAS**
2. Seats, Belts, Harnesses ..... Secured
3. Heavy Objects ..... Secure or jettison

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4. **Mixture** ..... **IDLE CUTOFF**
5. **Master Switch** ..... **OFF**
6. Magneto Switches ..... OFF
7. **Fuel Selector** ..... **OFF**
8. Flaps ..... As Required
9. If time permits:
  - a. Transponder ..... 7700
  - b. Radio ..... Mayday (121.5)

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10. Approach:
  - a. High Winds, Heavy Seas ..... Land Into Wind
  - b. Light Winds, Heavy Swells ..... Parallel to Swells
11. Prior to touchdown:
  - a. **Cabin Door** ..... **Unlatched & Opened**

# Piper Archer III (PA-28-181)

## MAXIMUM GLIDE

|                                | ALTITUDE (AGL) | GLIDE DISTANCE |
|--------------------------------|----------------|----------------|
|                                | <b>1000</b>    | <b>1.8 nm</b>  |
| <b>V<sub>g</sub> - 76 KIAS</b> | 2000           | 3.5 nm         |
|                                | 3000           | 5.3 nm         |
| Power Off                      | 4000           | 7.0 nm         |
|                                | 5000           | 8.8 nm         |
| <b>Flaps RETRACTED (o)</b>     | 6000           | 10.5 nm        |
|                                | 7000           | 12.3 nm        |
| Zero Wind                      | 8000           | 14.0 nm        |
|                                | 9000           | 15.8 nm        |
| 2550 lbs.                      | 10000          | 17.5 nm        |
|                                | 11000          | 19.3 nm        |
|                                | 12000          | 21.0 nm        |

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