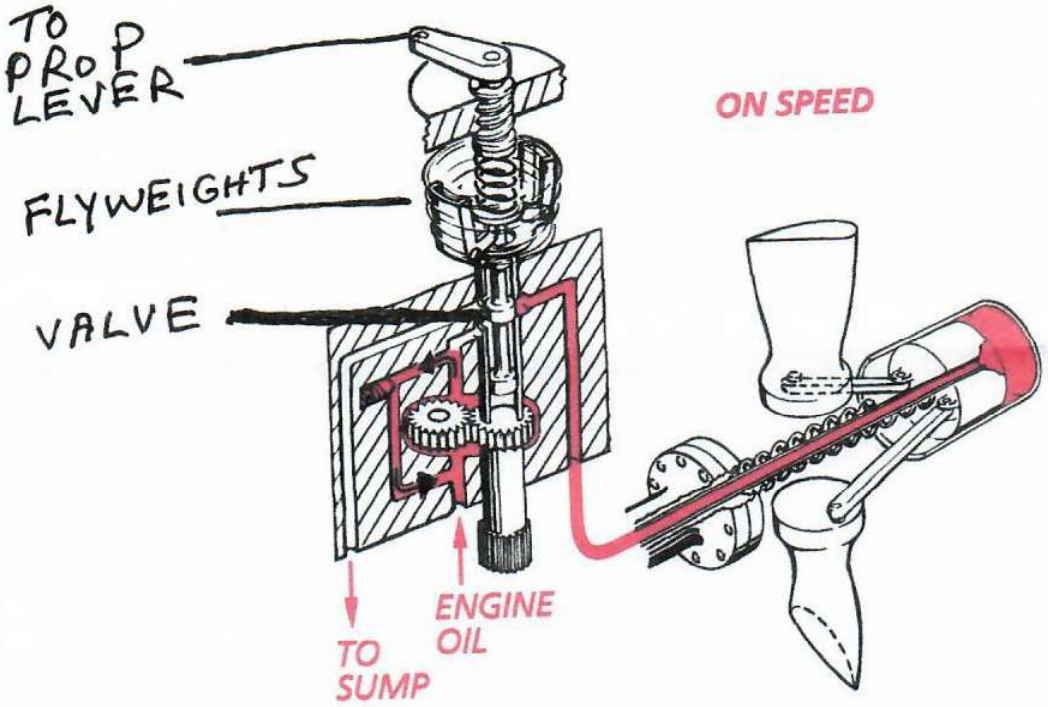
## So how does all this result in constant speed?

By producing what is known as an ON SPEED condition. This exists when the RPM is constant. Movement of the cockpit control has set the speeder spring at the desired RPM. The flyweights have positioned the pilot valve to direct oil to or from the propeller. This, in turn, has positioned the propeller blades at the pitch that absorbs the engine power at the RPM selected. When the moment the RPM balance occurs, the force of the flyweights equals the speeder spring load. This positions the pilot valve in the constant RPM position, with no oil flowing to or from the propeller.




## OK, so we're flying along at constant RPM. What happens if the airplane begins to climb or engine power is decreased?

This results in an UNDERSPEED condition. Airspeed is reduced and, since the pitch of the propeller blades is too high, the engine starts to slow down. However, the instant this happens the flyweights will drop, causing the pilot valve to move down. Then oil flows from the propeller, reducing the pitch of the blades. This automatically increases the speed of the engine to maintain the former RPM setting.

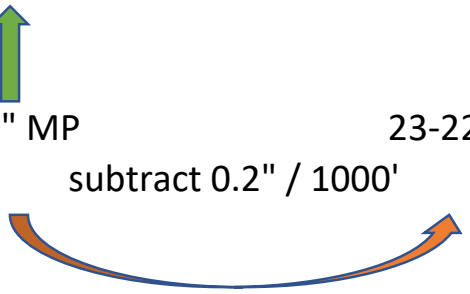
# Piper Dakota (PA-28-236)
# Lycoming O-540-J3A5

## Simplified Power Chart

* With power settings less than 2300 RPM, maximum MP is limited
* Above 8000' ISA, reduce climb speed 1 kt / 1000' and lean to 125F ROP

| (Pressure) Altitude | 65% Power @ 2300 RPM *13.8 GPH* | | 75% Power @ 2300 RPM *16.5 GPH* | |
|---|---|---|---|---|
| 2000 | 21.2" MP | 120 KTAS | 23.4" MP | 130 KTAS |
| 3000 | 21.0" MP | 122 KTAS | 23.1" MP | 132 KTAS |
| 4000 | 20.8" MP | 124 KTAS | 22.8" MP | 135 KTAS |
| 5000 | 20.5" MP | 126 KTAS | 22.6" MP | 137 KTAS |
| 6000 | **20.3" MP** | **128 KTAS** | 22.3" MP | 138 KTAS |
| 7000 | **20.1" MP** | **130 KTAS** | **F.T.** | **140 KTAS** |
| 8000 | **19.9" MP** | **132 KTAS** | | |
| 9000 | 19.7" MP | 134 KTAS | | |
| 10000 | 19.4" MP | 136 KTAS | | |

Typical Flight Altitudes




75% Power Compared to 65% Power

MP = 2" Higher

Fuel Burn = ~3 GPH Greater

TAS = 10 Knots Faster

Range = 70 NM less

# Piper Dakota (PA-28-236)

# Engine Monitor

## Current Engine Monitor (As of May 2019)

**Fuel Flow**
(For Leaning)


Green = CHT <400F
Yellow = CHT 400-449F
Red = CHT 450F+

White = EGT

## Future Engine Monitor (Summer 2019)

EGT & CHT
graphical display


**Analog/Digital**
**MP & RPM gauges**

**Fuel Flow**
(For Leaning)

Cyan = EGT
Green = CHT

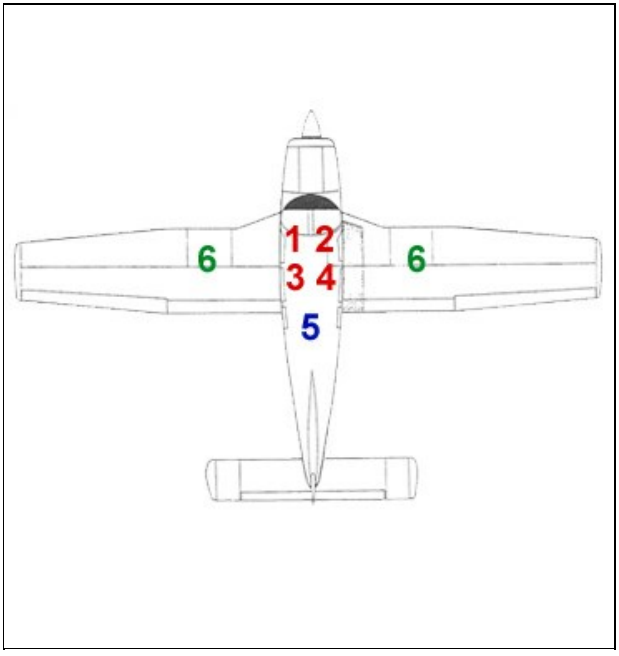
**Hottest CHT**

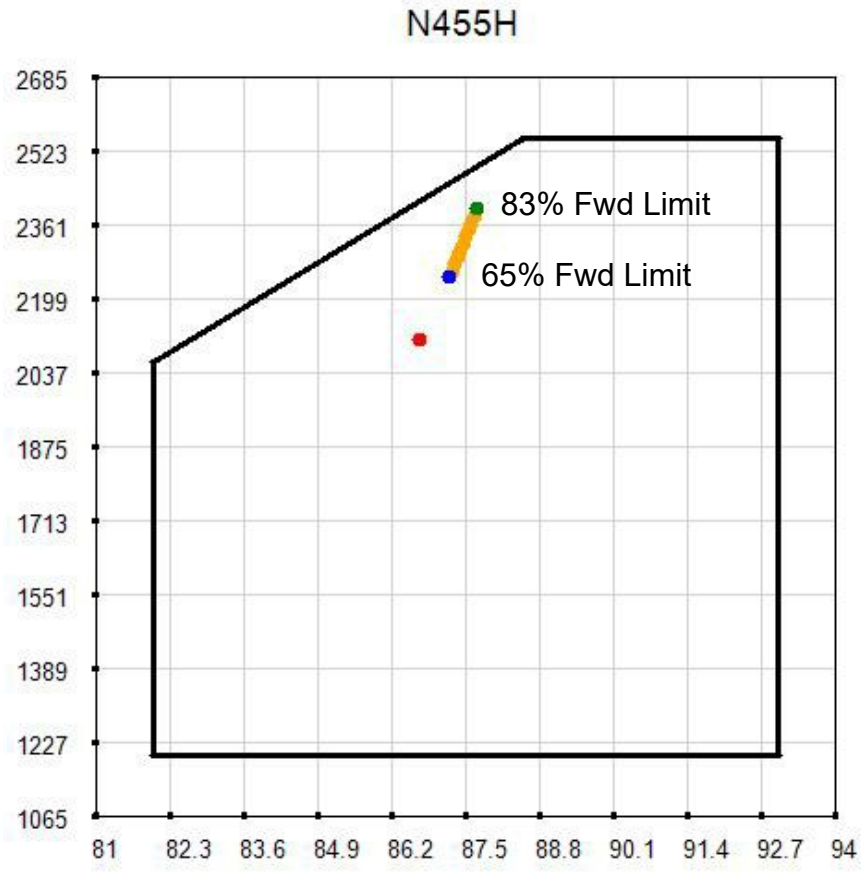
Keep CHTs below:

430 during climb

400 during cruise

| | |
|---|---|
| Departure | |
| Arrival | |
| PIC | |
| SIC | |
| AC Performance | PA 28 181 ARCHER II |
| BEW/C.G. | 1727.5/87 |
| Pilot Seat | 170 |
| Seat 2 | 170 |
| Seat 3 | 25 |
| Seat 4 | 0 |
| Baggage Compartment 1 | 15 |
| Fuel Units | Gal. |
| Fuel Tank (Max. 48 gal.) | 48 |
| Fuel Burn | 25 |
| Max. Takeoff Weight | 2550 lbs. |
| Under Gross Weight | 154 lbs. |
| Zero Fuel Weight | 2108 lbs. |
| Payload | 380 lbs. |
| Time Stamp UTC - 05/04/2019 15:30 | |




| | Weight | Fwd Limit | C.G. | Aft Limit | % of MAC |
|---|---|---|---|---|---|
| Takeoff | 2396 | 86.46 | 87.7 | 93 | N/A |
| Landing | 2246 | 84.47 | 87.21 | 93 | N/A |
| Zero Fuel | 2108 | 82.64 | 86.7 | 93 | % |

Chart Legend

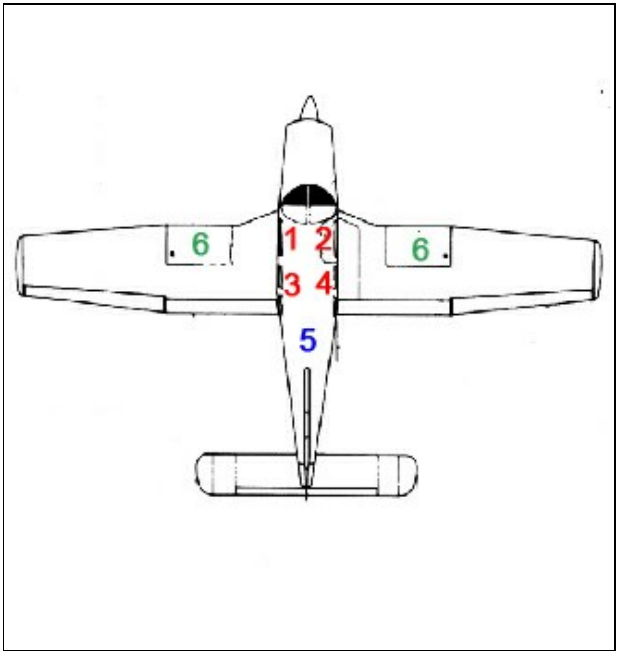
- TakeOff C.G.
- Landing C.G.
- FuelBurn C.G.
- Zero Fuel Weight
- Envelope

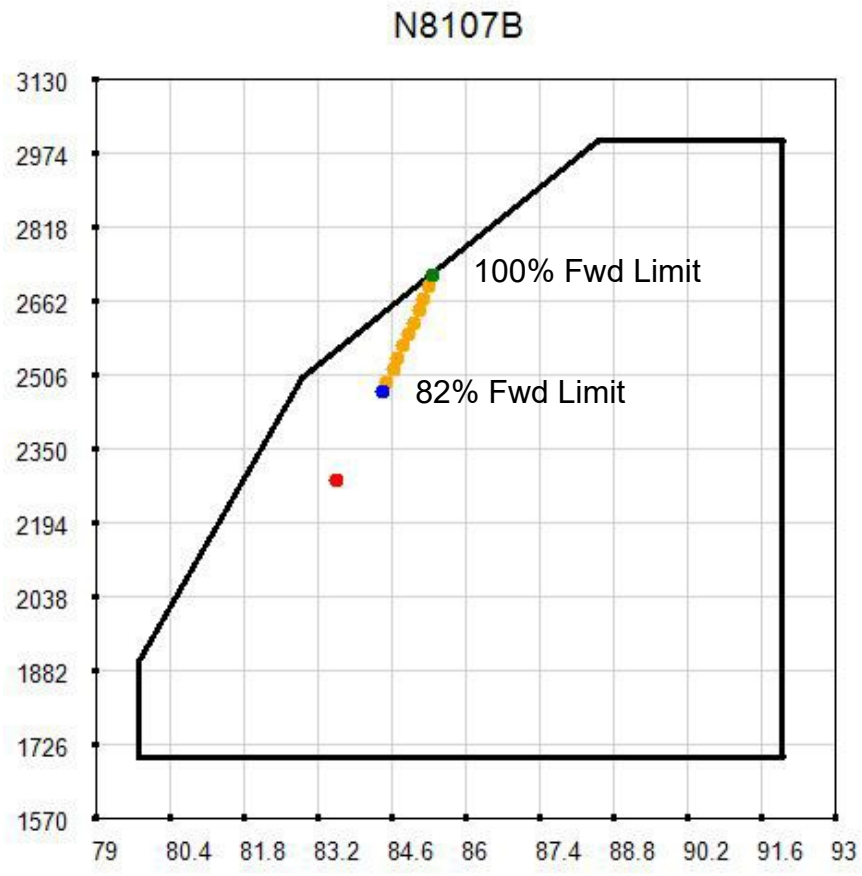
Takeoff = 48% Forward CG
52% Aft CG

Landing = 53% Forward CG
47% Aft CG

ZFW = 57% Forward CG
43% Aft CG

| | |
|---|---|
| Departure | |
| Arrival | |
| PIC | |
| SIC | |
| AC Performance | PA 28 236 DAKOTA |
| BEW/C.G. | 1904.7/83.2 |
| Pilot Seat | 170 |
| Seat 2 | 170 |
| Seat 3 | 25 |
| Seat 4 | 0 |
| Baggage Compartment 1 | 15 |
| Fuel Units | Gal. |
| Fuel Tank (Max. 72 gal.) | 72 |
| Fuel Burn | 41 |
| Max. Takeoff Weight | 3000 lbs. |
| Under Gross Weight | 283 lbs. |
| Zero Fuel Weight | 2285 lbs. |
| Payload | 380 lbs. |
| Time Stamp UTC - 05/04/2019 15:27 | |




| | Weight | Fwd Limit | C.G. | Aft Limit | % of MAC |
|---|---|---|---|---|---|
| Takeoff | 2717 | 85.33 | 85.38 | 92 | N/A |
| Landing | 2471 | 82.75 | 84.42 | 92 | N/A |
| Zero Fuel | 2285 | 81.79 | 83.56 | 92 | % |

Chart Legend

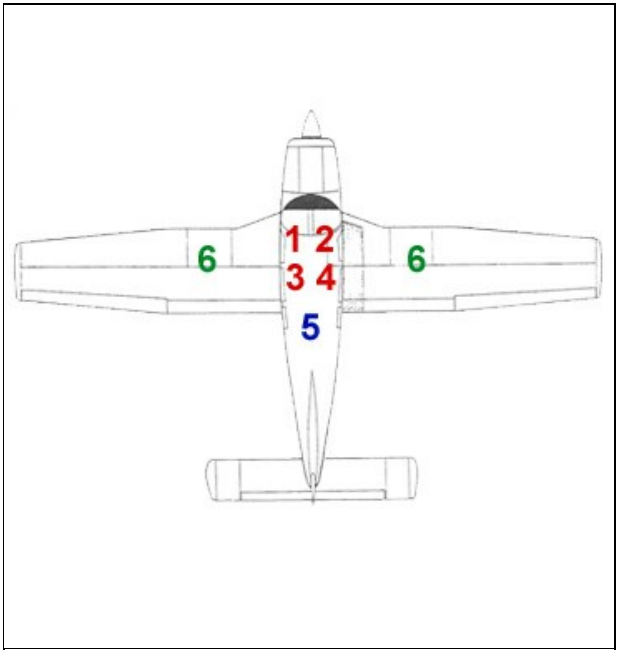
- TakeOff C.G.
- Landing C.G.
- FuelBurn C.G.
- Zero Fuel Weight
- Envelope

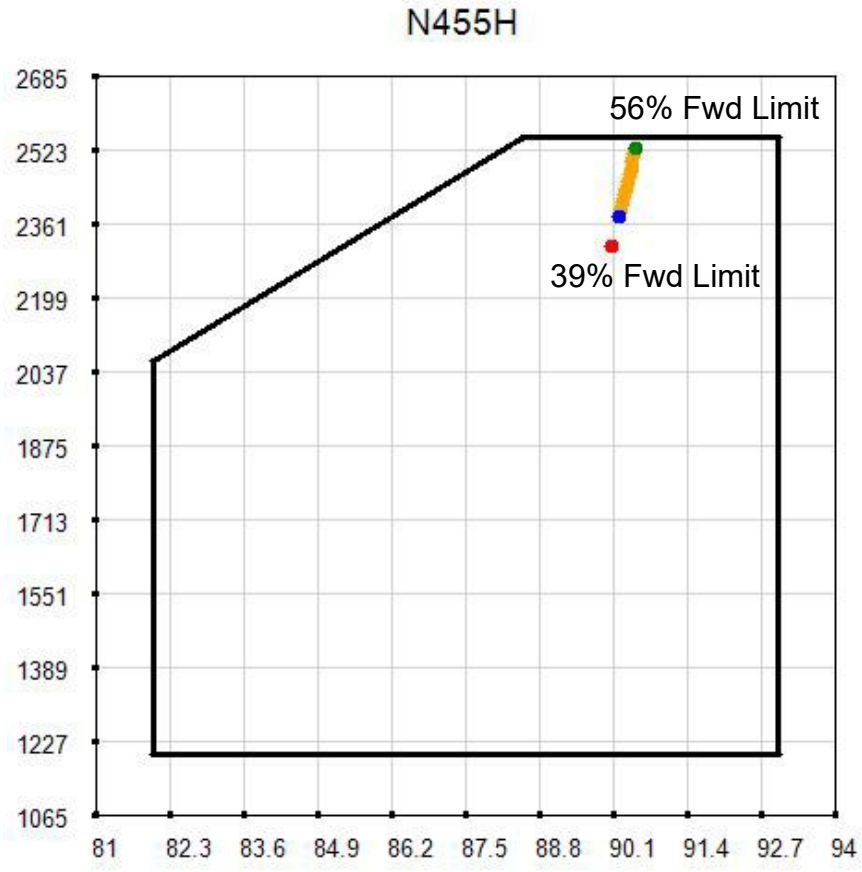
Takeoff = 54% Forward CG
46% Aft CG

Landing = 62% Forward CG
38% Aft CG

ZFW = 69% Forward CG
31% Aft CG

| | |
|---|---|
| Departure | |
| Arrival | |
| PIC | |
| SIC | |
| AC Performance | PA 28 181 ARCHER II |
| BEW/C.G. | 1727.5/87 |
| Pilot Seat | 170 |
| Seat 2 | 170 |
| Seat 3 | 5 |
| Seat 4 | 170 |
| Baggage Compartment 1 | 70 |
| Fuel Units | Gal. |
| Fuel Tank (Max. 48 gal.) | 36 |
| Fuel Burn | 25 |
| Max. Takeoff Weight | 2550 lbs. |
| Under Gross Weight | 21 lbs. |
| Zero Fuel Weight | 2313 lbs. |
| Payload | 586 lbs. |
| Time Stamp UTC - 05/04/2019 15:29 | |




| | Weight | Fwd Limit | C.G. | Aft Limit | % of MAC |
|---|---|---|---|---|---|
| Takeoff | 2529 | 88.22 | 90.49 | 93 | N/A |
| Landing | 2379 | 86.23 | 90.21 | 93 | N/A |
| Zero Fuel | 2313 | 85.36 | 90.07 | 93 | % |

Chart Legend

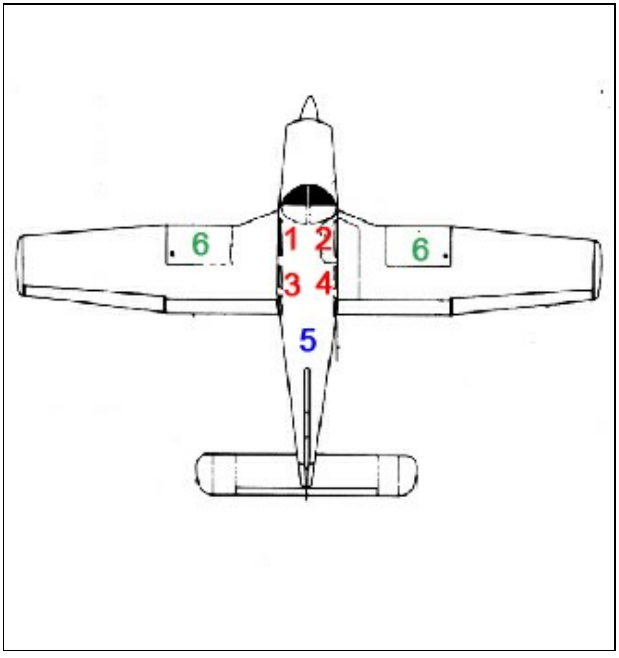
- TakeOff C.G.
- Landing C.G.
- FuelBurn C.G.
- Zero Fuel Weight
- Envelope

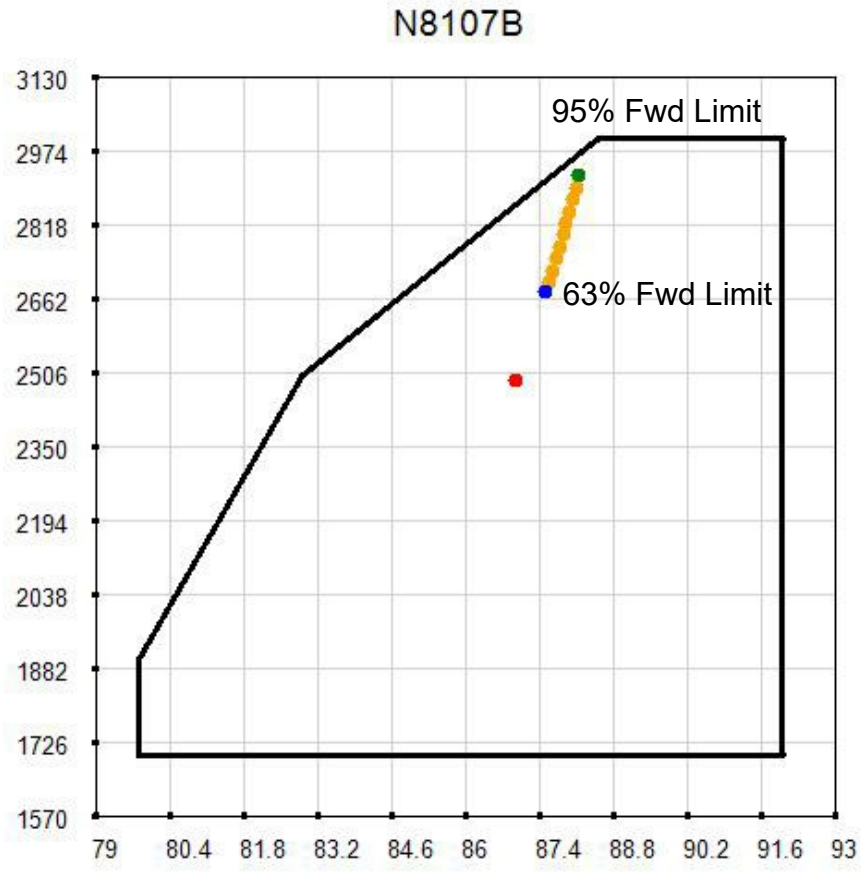
Takeoff = 23% Forward CG
77% Aft CG

Landing = 25% Forward CG
75% Aft CG

ZFW = 27% Forward CG
73% Aft CG

| | |
|---|---|
| Departure | |
| Arrival | |
| PIC | |
| SIC | |
| AC Performance | PA 28 236 DAKOTA |
| BEW/C.G. | 1904.7/83.2 |
| Pilot Seat | 170 |
| Seat 2 | 170 |
| Seat 3 | 5 |
| Seat 4 | 170 |
| Baggage Compartment 1 | 70 |
| Fuel Units | Gal. |
| Fuel Tank (Max. 72 gal.) | 72 |
| Fuel Burn | 41 |
| Max. Takeoff Weight | 3000 lbs. |
| Under Gross Weight | 78 lbs. |
| Zero Fuel Weight | 2490 lbs. |
| Payload | 585 lbs. |
| Time Stamp UTC - 05/04/2019 15:26 | |




| | Weight | Fwd Limit | C.G. | Aft Limit | % of MAC |
|---|---|---|---|---|---|
| Takeoff | 2922 | 87.63 | 88.14 | 92 | N/A |
| Landing | 2676 | 84.87 | 87.51 | 92 | N/A |
| Zero Fuel | 2490 | 82.85 | 86.96 | 92 | % |

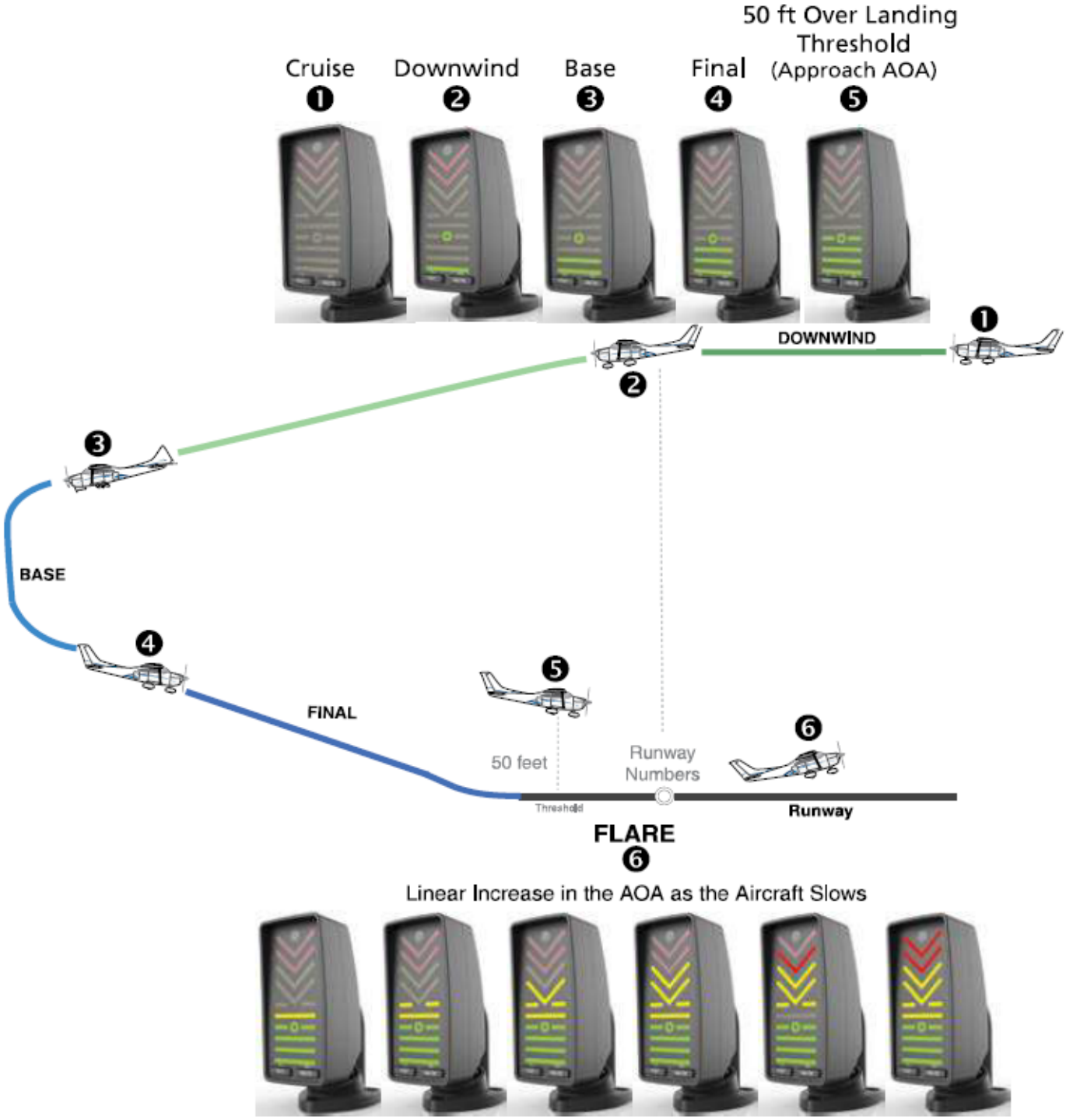
Chart Legend

- TakeOff C.G.
- Landing C.G.
- FuelBurn C.G.
- Zero Fuel Weight
- Envelope

Takeoff = 32% Forward CG
68% Aft CG

Landing = 37% Forward CG
63% Aft CG

ZFW = 41% Forward CG
59% Aft CG




Example Indications for a Typical Decelerating Approach and Flare

Routes

| Airports | Distance |
|---|---|
| KDXR - KLZU | 667nm |
| KDXR - KFME | 204nm |
| KDXR - KBID | 87nm |

Loading

| Location | Weight |
|---|---|
| Pilot | 170 |
| Front Pass. | 170 |
| Left Rear Pass. | 5 |
| Right Rear Pass. | 170 |
| Baggage | 70 |
| TOTAL | 585 |

**Archer**

| Payload | Weight | Fuel/Weight |
|---|---|---|
| Aircraft (55H) | 1728 | |
| Loading | 585 | |
| Sub-Total | 2313 | |
| Remaining | 237 | 39.5 |
| Fuel | 36 | 216 |
| Total | 2529 | |

| | Airspeed | |
|---|---|---|
| Altitude | 65% | 75% |
| 4000 | 116 | 124 |
| 6000 | 117 | 126 |
| 7000 | | 127 |
| 8000 | 118 | |

| Endurance | | |
|---|---|---|
| GPH | 9.5 | 11.5 |
| Time | 3.8 | 3.1 |

**Dakota**

| Payload | Weight | Fuel/Weight |
|---|---|---|
| Aircraft (07B) | 1905 | |
| Loading | 585 | |
| Sub-Total | 2490 | |
| Remaining | 510 | 85 |
| Fuel | 72 | 432 |
| Total | 2922 | |

| | Airspeed | |
|---|---|---|
| Altitude | 65% | 75% |
| 4000 | 124 | 135 |
| 6000 | 128 | 138 |
| 7000 | | 140 |
| 8000 | 132 | |

| Endurance | | |
|---|---|---|
| GPH | 13.8 | 16.5 |
| Time | 5.2 | 4.4 |

Trip Comparison

| Aircraft | Power | Distance | Time | Fuel | Cost |
|---|---|---|---|---|---|
| Dakota | | 667 | 5.7 | 73.4 | $867.26 |
| | 65% | 204 | 1.6 | 22.9 | $266.85 |
| | | 87 | 0.7 | 10.0 | $116.75 |
| | | 667 | 5.3 | 81.5 | **$800.54** |
| | 75% | 204 | 1.5 | 25.1 | **$250.17** |
| | | 87 | 0.6 | 10.8 | **$100.07** |
| Archer | | 667 | 6.7 | 62.2 | $676.59 |
| | 65% | 204 | 1.8 | 19.3 | $213.66 |
| | | 87 | 0.7 | 9.7 | $83.09 |
| | | 667 | 6.4 | 68.5 | **$640.98** |
| | 75% | 204 | 1.7 | 21.1 | **$201.79** |
| | | 87 | 0.7 | 10.3 | **$83.09** |
| Difference | | 667 | -1.0 | 11.1 | $190.67 |
| | 65% | 204 | **-0.2** | 3.7 | $53.19 |
| | | 87 | 0.0 | 0.3 | $33.66 |
| | | 667 | **-1.1** | 13.0 | $159.56 |
| | 75% | 204 | **-0.2** | 4.0 | $48.38 |
| | | 87 | **-0.1** | 0.5 | $16.98 |