

**Chapter 2  
Limitations**

**Table of Contents**

General..... 3

Kinds of Operating Limitations ..... 3

Kinds of Operation Min. Equipment List..... 3

Weight and Center of Gravity Limitations ..... 4

Maneuvering Limitations ..... 4

Flight Load Factor Limitations ..... 4

Power Plant Limitations ..... 5

Engine Operating Limitations..... 5

Oil Specifications ..... 5

Propeller Specifications..... 6

Power plant Instrument Markings..... 6

Fuel Limitations ..... 6

Electrical System Limitations..... 7

Airspeed Limitations ..... 8

System and Equipment Limitations ..... 9

Placards..... 9

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**General**

This section presents the operating limitations, instrument markings and placards necessary for the safe operation of the PA-28R-200 Arrow. Limitations contained in this section of the manual are approved by the Federal Aviation Administration.

**CAUTION**

*Observance of these limitations is mandatory.*

Flight crews shall be able to recall information contained within the **solid-box** outlines from memory during normal operations and be able to apply the information as appropriate the operation being conducted. Rote memorization is not a replacement for a correlative level of knowledge.

**NOTE**

For aircraft equipped with specific options, refer to Section 9, “Supplements”, of the Pilot’s Information Manual (PIM) and FAA Approved Airplane Flight Manual for amended operating limitations, procedures, performance data and/or other necessary information.

**Kinds of Operating Limitations**

The airplane is approved for the following operations when equipped in accordance with 14 CFR Part 91 or Part 135:

- ⊕ Day V.F.R.
- ⊕ Night V.F.R.
- ⊕ Day I.F.R.
- ⊕ Night I.F.R.
- ⊖ Non-icing.

**Kinds of Operation Minimum Equipment List**

Refer to the Airplane Flight Manual equipment list provided by the aircraft manufacturer to identify the systems and equipment upon which type certification for each kind of operation was based.

**NOTE**

Bridgewater State College does not operate the PA-28R-200 Arrow with a MMEL. See Chapter 8, MEL Decision Sequence for operating the aircraft with inoperative or uninstalled equipment.

**CAUTION**

*Cleaners containing ammonia are PROHIBITED.*

**Weight and Center of Gravity Limitations**

**Structural Weight Limitations**

Maximum Ramp Weight.....	2,658 lbs
Maximum Takeoff Weight.....	2,650 lbs
Maximum Landing Weight.....	2,650 lbs
Maximum Weight in Rear Baggage Area.....	200 lbs

**Center of Gravity Range and Limitations**

<b>Weight</b>	<b>Forward Limit</b>	<b>Aft Limit</b>
1800 lbs or less	80.0 inches	93.0 inches
2300 lbs	82.0 inches	93.0 inches
2650 lbs	87.3 inches	93.0 inches

**NOTE**

The reference datum for the PA-28R-200 Arrow is located 78.4 inches forward of the wing leading edge at the inboard intersection of the straight and tapered section.

**Maneuvering Limitations – Normal Category**

The PA-28R-200 Arrow is rated in the Normal category. The only authorized maneuvers in the PA-28R Arrow are those maneuvers incidental to normal flying, stalls (except whip stalls), lazy eights, chandelles, and steep turns (with not more than 60<sup>0</sup> of bank).

**Flight Load Factor Limitations - Normal Category**

**Positive Load Limit**  
+3.8 g

**Negative Load Limit**  
No Inverted Maneuvers Approved

**WARNING**

**All intentional aerobatic maneuvers, including spins, are PROHIBITED.**

### Power Plant Limitations

Manufacturer.....Lycoming  
 Model Number ..... IO-360C1C  
 Maximum Horsepower .....200  
 Maximum Rotation Speed (RPM) .....2700  
 Minimum Fuel Flow..... 0.5 psi/2.0 gal/hr  
 Minimum Fuel Pressure..... 14 psi  
 Maximum Fuel Flow ..... 12 psi/21.4 gal/hr  
 Maximum Fuel Pressure..... 45 psi  
 Fuel Minimum Grade ..... 100/100 LL (Blue)

### Engine Operating Limitations for Takeoff and Max Continuous Power

Takeoff Power.....	200 hp @ 2700 RPM
Maximum Continuous Power.....	200 hp @ 2700 RPM
Maximum Oil Temperature.....	245°F
Maximum Oil Pressure (Warm).....	90 psi
Maximum Oil Pressure (Cold).....	90 psi
Minimum Oil Pressure.....	25 psi
Maximum Fuel Flow.....	12 psi/21.4 gal/hr

### Oil Specifications

Average Ambient OAT	Single Viscosity Grade	Multi-Viscosity Grade
ABOVE 60°F	SAE 50	SAE 40 OR 50
30° - 60°F	SAE 40	SAE 40
10° - 70°F	SAE 30	SAE 40 or 20W-30
BELOW 10°F	SAE 20	SAE 20W - 30

Maximum Oil Capacity ..... 8 qts  
 Minimum Oil Quantity ..... 2 qts  
 Oil Pressure (Normal)..... 60-90 psi  
 Oil Temperature (Normal Cruise)..... 75<sup>0</sup>-245°F

### CAUTION

*Do not operate the engine with less than four (5) quarts of oil. It is recommended that the oil be changed every 50 hours and sooner under unfavorable operating conditions.*

**Propeller Specifications**

Manufacturer..... Hartzell / Model HC-C2YK-1/7666A-2  
 Type..... Controllable pitch  
 Max. Diameter ..... 74”  
 Min. Diameter ..... 72.5”  
 Blade Angle Limits ..... Low 14.0<sup>0</sup> +/- 0.2<sup>0</sup>  
 ..... High 29.0<sup>0</sup> +/- 2.0<sup>0</sup>

**CAUTION**

*Avoid continuous static operations (over 5 minutes)  
 between 1500 - 1950 RPM below 15” of manifold pressure.*

**Power Plant Instrument Markings**

**Power Plant Instrument Markings**

<b>INSTRUMENT</b>	<b>Red Line (Min)</b>	<b>Yellow Arc (Lower)</b>	<b>Green Arc Normal</b>	<b>Yellow Arc (Upper)</b>	<b>Red Line (Max)</b>
Tachometer (RPM)	-----	-----	500 - 2700	-----	2700
Oil Pressure (PSI)	25 – 60*	-----	60 – 90	-----	90
Oil Temp. (° F)	-----	-----	75 – 245	-----	245
Fuel Flow/Press. (GPH)	2.0 gph 14 psi	-----	21.4 gph 14 – 45 psi	-----	21.4 gph 45 psi
Vacuum Press. (Hg)	-----	-----	4.9 – 5.1	-----	-----

\* Range at Idle

**Fuel Limitations**

Approved Fuel..... Aviation Grade 100LL (Blue) or 100 (Green)  
 Total Capacity ..... 50 Gallons  
 Total Usable Fuel (each tank)..... 24 Gallons  
 Usable Fuel (each tank) when filled to tabs ..... 17 gallons  
 Unusable Fuel (each tank)..... 2 Gallons

**WARNING**

**The fuel remaining in the tank(s) when the quantity indicator reads zero cannot be safely used in flight.**

**CAUTION**

*Flight crews shall avoid maneuvers that could uncover or “un-port” the wing outlet in the fuel tanks. Un-porting can result in fuel flow interruption and power loss. Avoid extreme running takeoffs, slips/skids resulting in altitude loss in excess of 2000’, or other radical or extreme maneuvers.*

**Electrical System Limitations**

Alternator Limitations ..... Maximum 12 Volts  
Amps Load..... Maximum 60 Amps  
Battery Output..... 12 Volts, 25 Amp/Hr

## Airspeed Limitations

### CAUTION

*The Airspeed Indicator for this aircraft is marked initially as MPH (outer ring) and converted to KIAS (inner ring). Flight crews must take care to adhere to published airspeed limitations regardless of the type of marking used.*

Symbol	Reference	Definition	MPH	KIAS
<b>V<sub>FE</sub></b>	Max Flap Extend Speed	Do not exceed this speed with wing flaps extended.	125	109
<b>V<sub>LO</sub></b>	Max Landing Gear Operating Speed	Do not cycle the landing gear above these speeds.		
		UP	125	109
		DOWN	150	130
<b>V<sub>LE</sub></b>	Max. Landing Gear Extended Speed	Do not exceed this speed with the landing gear extended	150	130
<b>V<sub>A</sub></b>	Maneuvering Speed	Do not make full or abrupt control movements above this speed.		
		2600 lbs.	131	114
		1800 lbs.	96	83
<b>V<sub>NO</sub></b>	Max Structural Cruising Speed	Do not exceed this speed in turbulent air	170	148
			to 214	to 186
<b>V<sub>NE</sub></b>	Never Exceed Speed	Maximum speed for all operations.	214	186
<b>V<sub>S1</sub></b>	Stall Speed, Specified Configuration	Stall speed in a specified configuration, typically gear up, flaps up	71	62
<b>V<sub>SO</sub></b>	Stall Speed, Landing Configuration	Stall speed in the landing configuration, gear down, flaps down	64	56
<b>V<sub>X</sub></b>	Best Angle of Climb (max climb over distance)	Gear Up, Flaps Up	96	83
		Gear Down, Flaps Up	85	74
<b>V<sub>Y</sub></b>	Best Rate of Climb (max speed in climb)	Gear Up, Flaps Up	100	87
		Gear Down, Flaps Up	95	83
<b>V<sub>G</sub></b>	Best Gliding Speed	Gear Up, Flaps Up	105	91

**Airspeed Indicator Markings**

<b>Instrument Marking</b>	<b>Explanation</b>	<b>MPH</b>	<b>KIAS</b>
White Arc	Full Flap Operating Range: Lower limit is max. weight $V_{SO}$ in the landing configuration. Upper limit is maximum speed permissible with flaps fully extended.	64-125	56-109
Green Arc	Normal Operating Range: Lower limit is max. weight $V_{S1}$ with flaps retracted. The upper limit is $V_{NO}$ .	71-170	62-148
Yellow Arc	Caution Range: Flight in this range is limited to smooth air only, and then with caution.	170-214	148-186
Red Line	Never Exceed Speed: Maximum speed for all operations.	214	186

**System and Equipment Limitations**

Maximum Seating.....4

**NOTE**

The maximum demonstrated crosswind for this aircraft is 20 MPH (17 KIAS).

**Placards**

**In full view of the pilot:**

“THIS AIRCRAFT APPROVED FOR NIGHT I.F.R. NON-ICING FLIGHT WHEN EQUIPPED IN ACCORDANCE WITH FAR 91 OR FAR 135.”

“THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS, AND MANUALS.”

**In full view of the pilot, the following takeoff and landing check lists will be installed:**

**TAKEOFF CHECKLIST**

- |                         |                        |                       |
|-------------------------|------------------------|-----------------------|
| Fuel on Proper Tank     | Mixture – Set          | Flaps – Set           |
| Electric Fuel Pump – On | Propeller – Set        | Trim Tab – Set        |
| Engine Gauges – Checked | Fasten Belts/Harnesses | Controls - Free       |
| Alternate Air – Closed  |                        | Doors – Latched       |
| Seat Backs Erect        |                        | Air Conditioner – Off |

**LANDING CHECKLIST**

Fuel on Proper Tank	Electric Fuel Pump – On	Gear Down (150 MPH Max)
Seat Backs Erect	Mixture – Rich	Flaps - Set (125 MPH Max)
Fasten Belts/Harnesses	Propeller – Set	Air Conditioner – Off

The “AIR CONDITIONER OFF” item in the above takeoff and landing check lists is mandatory for air conditioned aircraft only.

**On the instrument panel in full view of the pilot:**

“NO ACROBATIC MANEUVERS INCLUDING SPINS APPROVED.”

**On the instrument panel in full view of the pilot:**

“MANEUVERING SPEED - 131 MPH.”

**On the instrument panel in full view of the pilot:**

“DEMONSTRATED CROSSWIND COMPONENT – 20 MPH”

**Adjacent to upper door latch:**

“ENGAGE LATCH BEFORE FLIGHT”

**On inside of baggage compartment door:**

“BAGGAGE MAXIMUM 200 LBS. SEE WEIGHT AND  
BALANCE DATA FOR BAGGAGE LANDINGS BETWEEN 150 LBS.  
AND 200 LBS.”

**Near emergency gear lever:**

“EMERGENCY DOWN”

**Near emergency gear lever: (aircraft equipped with back-up gear extender)**

“OVERRIDE ENGAGED AUTO-EXT-OFF  
LOCK PIN ON SIDE  
TO ENGAGE OVERRIDE:  
PULL LEVER FULL UP, PUSH LOCK PIN  
TO RELEASE OVERRIDE:  
PULL LEVER FULL UP AND RELEASE.”

**Near gear selector switch:**

“GEAR UP ..... 125 MPH MAX”  
“DOWN ..... 150 MPH MAX”

**On the instrument panel in full view of the pilot:**

“OIL COOLER WINTERIZATION PLATE TO BE  
REMOVED WHEN AMBIENT TEMPERATURE EXCEEDS  
50<sup>0</sup> F.”

**On the instrument panel in full view of the pilot when the supplementary white strobe lights are installed:**

“WARNING – TURN OFF STROBE LIGHTS WHEN IN  
CLOSE PROXIMITY TO GROUND, OR DURING FLIGHT  
THROUGH CLOUD, FOG OR HAZE.”

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