

Limitations

Section II

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GENERAL

The data approved by Lancair International and the Limitations presented herein are those established by Lancair as applicable to the Models 235, 320/360 aircraft. Where there are differences between these models it will be so identified.

This section follows the format approved by the GAMA Specification #1, and is intended to provide operating guidelines and limitations specific to the Lancair aircraft only. All airspeeds quoted are given conventional nomenclature, are shown in knots, calibrated airspeed, and assume zero instrument error.

NOTE

It is imperative that you calibrate your airspeed system (static and pitot) to provide the corrections to the values shown below in KCAS or mph. If there is instrument (gauge) error that needs to be factored in also to reach KIAS.

AIRCRAFT OPERATING SPEEDS

Lancair 235

SPEED		MARKING		KCAS		(mph)	
Never Exceed Speed	V_{ne}	Red line	215	(248)			
Caution, smooth air only	V_a	Yellow Arc	165-215	(190-248)			
Maneuvering Speed	V_a		117	(135)			
Normal Oper Range	V_{no}	Green Arc	61-165	(70-190)			
Full Flap Oper Range	V_{fe}	White Arc	48-100	(55-114)			
Landing Gear Speed	V_{le}/V_{lo}		122	(140)			

Lancair 320/360

SPEED		MARKING		KCAS		(mph)	
Never Exceed Speed	V_{ne}	Red line	235	(270)			
Caution, smooth air only	V_a	Yellow Arc	183-235	(210-270)			
Maneuvering Speed	V_a		143	(165)			
Normal Oper Range	V_{no}	Green Arc	70-183	(80-210)			
Full Flap Oper Range	V_{fe}	White Arc	54-100	(62-114)			
Landing Gear Speed	V_{le}/V_{lo}		122	(140)			

POWERPLANT LIMITATIONS

Engines

These Lancairs are powered by standard aircraft engines, the power varying from 118 to 180 HP. They are horizontally opposed, air cooled, four cylinder engines made by Textron Lycoming.

OPERATING LIMITATIONS

Operating limitations for the various engines used in the Lancair Models 235, 320, and 360 are shown below. If your engine differs, you must account for that. In addition, the data and limits shown is for new specification engines and does not reflect any degradation due to age or number and quality of overhauls.

Performance will vary obviously depending on the engine/propeller combination as well. Fixed pitch propellers will have significant effects on takeoff and cruise capabilities for example.

Lancair 235

118 HP, O-235-12C Specification

T.O. & Max Continuous RPM

Full throttle, red line, 2750 rpm

Normal operation, 600(idle) 2200-2700 rpm(cruise)

Cylinder Heat Temperatures

Maximum, 450°F (232°C)

Normal Operating Range, 200-430 °F (90-221°C)

Recommended, 380-410°F (193-210°C)

Oil Temperatures

Maximum, 240°F (115°C)

Desired Operating, 210°F (100°C)

Oil Pressure

Minimum Operating (idle), 40 psig (2.72 atm)

Normal Operation, 60-70 psi (4-4.76 atm)

Maximum (starting & warm up), 80 psi (5.44 atm)

Fuel Flow

75% cruise, 2500 rpm/6.7 gph

65% cruise, 2400 rpm/5.8 gph

Fuel Pressure (carbureted)

Maximum, 6.0 psig(0.41 atm)

Recommended, 4.0 psig (0.27 atm)

Minimum, 2.0 psig (0.136 atm)

Vacuum Pressure

Normal Operating Range, 4.8-5.2 In.Hg.

160 HP, IO-320-D1B Specification

Power Settings

Full Throttle, 160 HP, 2700 rpm
75% Pwr, 120 HP, 10 gph, 2450 rpm
65% Pwr, 104 HP, 8.8 gph, 2350 rpm
Normal Operation, 600 (idle) 2700 rpm(cruise)

Cylinder Head Temperatures

Maximum, 500 °F (260°C)
Normal Operating Range, 150-400°F(66-205°C)

Oil Pressures

Minimum Operating (idle), 25 psig (1.70 atm)
Normal Operation, 55-95 psig (3.74-6.46 atm)
Maximum, starting & warm up, 115 psig (7.8 atm)

Fuel Pressure (Injected)

Normal 19-25 psig (1.29-1.70 atm)

Boost Pump (For Injected engines)

Maximum (zero flow), 45 psi (3.06 atm)
Minimum flow (Full fuel flow), 12 psi (0.82 atm)

Vacuum Pressure

Normal Operating Range, 4.8-5.2 in.Hg.

Lancair 320

160 HP, O-320-D1F Specification

Power Settings

Full Throttle, 160 HP, 2700 rpm
75% Pwr, 120 HP, 10 gph, 2450 rpm
65% Pwr, 104 HP, 8.8 gph, 2350 rpm
Normal Operation, 600-2700 rpm

Cylinder Head Temperatures

Maximum, 500 °F (260°C)
Normal Operating Range, 150-400°F

Oil Pressures

Minimum Operating (idle), 25 psig (1.7 atm)
Normal Operation, 55-95 psig (3.74-6.46 atm)
Maximum, starting & warm up, 115 psig (7.8 atm)

Fuel Pressure (Carbureted)

Maximum, 8 psi (0.54 atm)
Recommended, 3.0 psi (0.20 atm)
Minimum, 0.5+ psi (0.035 atm)

Vacuum Pressure

Normal Operating Range, 4.8-5.2 in.Hg.



235

320

360

Lancair 360

180 HP, O-360-A1A Specification

Power Settings

Full Throttle, 180 HP, 2700 rpm
75% Pwr, 135 HP, 10.5 gph, 2450 rpm
65% Pwr, 117 HP, 9.0 gph, 2350 rpm

Cylinder Head Temperatures

Normal Operation, 600-2700 rpm
Maximum, 500 °F (260°C)
Normal Operating Range, 150-400°F

Oil Pressures

Minimum Operating (idle), 25 psig (1.70 atm)
Normal Operation, 55-95 psig (3.74-6.46 atm)
Maximum, starting & warm up, 115 psig (7.82 atm)

Fuel Pressure (Carbureted)

Maximum, 8 psi (0.54 atm)
Recommended, 3.0 psi (0.20 atm)
Minimum, 0.5+ psi (0.034 atm)

Vacuum Pressure

Normal Operating Range, 4.8-5.2 in.Hg.

Lancair 360

180 HP, IO-360-B1B Specification

Power Settings

Full Throttle, 180 HP, 2700 rpm
75% Pwr, 135 HP, 11.0 gph, 2450 rpm
65% Pwr, 117 HP, 8.5 gph, 2350 rpm

Cylinder Head Temperatures

Normal Operation, 600-2700 rpm
Maximum, 500 °F (260°C)
Normal Operating Range, 150-400°F

Oil Pressures

Minimum Operating (idle), 25 psig (1.70 atm)
Normal Operation, 55-95 psig (3.74-6.46 atm)
Maximum, starting & warm up, 115 psig (7.82 atm)

Fuel Pressure (Injected)

Maximum, 35 psi (2.38 atm)

Boost Pump (Injected)

Maximum (zero flow), 45 psi (3.06 atm)
Minimum flow (Full fuel flow), 12 psi (0.82 atm)

Vacuum Pressure

Normal Operating Range, 4.8-5.2

Maximum (Red radial)
 Normal Oper Range (Green arc)
 Caution (Yellow Radial)
 200 to 245°F
 140 to 190°F
 245°F

OIL TEMPERATURE

Lycoming IO-360 values shown. The owner/operator should compare and correct (where different) for the particular model specifications for his installation.

NOTE

It is recommended that the following markings be made on the engine instrument gauges to conform to convention.

POWERPLANT INSTRUMENT MARKINGS

Following initial break-in of the engine it should be operated with an ashless dispersant oil (MIL-L-22851) conforming to the applicable Lycoming engine handbook. Break-in (the first 50 hours or until oil consumption has stabilized) should be accomplished using a corrosion preventative oil or straight mineral oil. Low power settings (less than 65-75%) should be avoided during the break-in period and the oil level checked frequently.

OIL SPECIFICATION

Blue, **Green, Maximum lead content 2 cc/gal

100LT* or 100** minimum

Lancair 320/360

Engine dependent, 80/87 or 100LT*

Lancair 235

FUEL GRADES (Aviation Gasoline)



Lancair 235:
Maximum Take-off Weight
Maximum Landing Weight
Standard Empty Weight
Maximum Baggage Weight

1400 lbs
1400 lbs
880 lbs
50 lbs

WEIGHT LIMITS

(Not normally monitored)
Gear up
Gear down

1,200 psi
0 to 600 psi

HYDRAULIC PRESSURE

VACUUM PRESSURE
Operating Range (Green arc)

4.8 to 5.2 in. Hg.

MISC INSTRUMENT MARKINGS

MANIFOLD PRESSURE
Operating Range (Green arc)
Maximum (Red radial)

15 to 29.6 in. Hg.
29.6 in. Hg.

CYLINDER HEAD TEMPERATURE
Operating Range (Green arc)
Maximum (Red line)

150 to 400°F
500°F

TACHOMETER
Operating Range (Green arc)
Maximum (Red radial)

600 to 2700 rpm
2700 rpm

Minimum (Idle, Red radial)
Caution Range (Yellow arc)
Operating Range (Green arc)
Maximum (Red radial)

25 psi
25 to 50 psi
55 to 95 psi
115 psi

OIL PRESSURE



The Lancair Model 235 and 320/360 aircraft are licensed as EXPERI-MENTAL. Spins are not recommended. Aerobatic maneuvers which have been flown by Lancair test pilots are shown in the chart below. Care must be used and smooth control inputs used at all times when performing aerobatics, and instruction in the maneuvers is consid-ered virtually mandatory. A parachute is FAA required, and no baggage should be carried while performing aerobatics. A thorough preflight should be conducted for loose items in the aircraft, and in the cockpit in particular. Another thorough post flight inspection of the aircraft is also recommended.

MANEUVER LIMITS

The MACs corresponding to the CG limits of 24.5 and 30.3 are 15% and 29% respectively.

MEAN AERODYNAMIC CHORD

The datum, i.e. Fuselage Station zero (0) is the back (aft) side of the firewall. (This is easily located through the nose wheel gear well.)

REFERENCE DATUM

The allowable Center of Gravity (CG) range is from Fuselage Station (FS) 24.5 to FS 30.3. This is valid for both the Model 235 and the 320/360. The aft CG limit is FS 30.3, and must be considered a firm limit. Loadings which place the CG further aft are dangerous and must not be accepted. A "Weight and Balance" sheet must be completed and carried in the aircraft at all times. See Section VI.

CENTER OF GRAVITY LIMITS (Gear Extended)

Lancair 320/360:	Maximum Take-off Weight	1685 lbs
	Maximum Landing Weight	1685 lbs
	Standard Empty Weight	1100 lbs
	Maximum Baggage Weight	60 lbs



Minimum fuel in the header tank is 8 gallons, Model 320/360 optional wing tanks should be empty. Sideslips should be limited to 30 seconds maximum and oil pressure should be monitored in accordance with the note above (*WARNING). Aerobatics are not approved with wing tip extensions.

All pilots are again reminded that instruction in aerobatics in the Lancair is highly desirable. Speed buildup during these maneuvers can be rapid and proper control usage is essential throughout the maneuver to remain within limits.

Speeds shown are calibrated. Corrections must be applied from a calibration of your aircraft to determine your proper entry indicated airspeeds.

NOTE

Since these engines do not have an inverted oil system extreme care must be used during low or negative "g" maneuvers. Lack of oil pressure will cause the propeller to go to flat pitch and engine overspeed will result. Transient oil pressure conditions near zero must be limited to less than two (2) seconds.

*** WARNING**

MANEUVER	ENTRY SPEED	MAX G'S
Chandelle	160 Kts	3.5
Lazy Eight	180 Kts	1.0 to 1.5
Stalls (not whip stalls)*	—	0.0 to 1.5
Loops	180 Kts	3.5
Aileron Rolls*	160 Kts	-1.0* to 1.0
Barrel Rolls	150 Kts	1.0
Split-S	85 Kts	3.5

DEMONSTRATED MANEUVERS





FLIGHT LOAD FACTOR LIMITS

Flaps up, at gross weight
 Flaps down, at gross weight
 Flaps up, at 1350 pounds

+4.5, to -2.3 g's
 +2.5 to -2.0 g's
 +6.0 to -3.0 g's

TYPES OF OPERATIONS AND LIMITS

The Lancair Models 235, 320, and 360 are approved for the following types of flight when the required equipment is installed and operations are conducted as defined in the LIMITATIONS section.

- 1. VFR, day and night
- 2. IFR, day and night

WARNINGS

- 1. Flight operations with passengers for hire and
- 2. Flight into known icing is prohibited.

FUEL QUANTITIES (Approx.)

Header tank
 11* gallons
 *may be less based on the type of canopy actuation)

Model 235 Wing Tanks (per wing) 11 gallons
 Model 320/360 Wing Tanks (per wing) 16 gallons
 Model 320/360 Optional wing tanks/wing 21 gallons

FUEL MANAGEMENT

Do not take-off with less than 8 gallons in the header tank. Since the engine is supplied fuel solely from the header tank, fuel must be transferred from each wing tank to the header tank periodically. There is no interconnection between the wing tanks. A header tank float operated warning light can be installed for alerting purposes. Fuel must be transferred from each wing by the pilot, maintaining left/right wing balance.

WARNING

Failure to shut off the fuel transfer pump from either wing tank could result in the pumping of fuel over-board, out the header tank vent line, and/or loss of the header tank cap from excessive pressurization.

2. Passenger Warning Statement.

- 1. The word "EXPERIMENTAL" must be placed where it can be prominently seen upon entry into the cabin. These letters must be at least 3 inches high, and contrast sufficiently to be seen on entry.
- 2. There are two placards which must be installed.

NOTE

An example of a switch marking is the strobe light switch. It should be labeled as "Strobe" with "On" and "Off" positions identified. Convention is up is "on" and down is "off" for electrical switches. Circuit breakers should be labeled as to their rating, i.e. "5 Amp", "35 Amp", etc.

Safety related items such as door opening instructions, emergency shut-off, and seat belt/shoulder harness requirements should be placed where obvious and made clearly understandable. An example of this would be the gear emergency extension procedure. It should be placed appropriately near the gear dump valve as well as being available in the EMERGENCY Section of this handbook (Red Tab).

All switches, lights, controls, adjustments and circuit breakers etc. must be marked with labels identifying what the switch, control, etc. is related to and what the position selects.

PLACARDS

Winter operations are acceptable with proper oil grades for the operating temperature.

WINTER OPERATIONS

These aircraft seat two, side by side, and can be flown from either seat (although dual rudder pedals and brakes are an option).

SEATING



Maximum.....	87 Kts
Gear CB.....	OUT
Gear Switch.....	DOWN
Gear Dump Valve.....	OPEN
Gear.....	3 Lights

Emergency landing gear extension (near gear)

Usable	_____ Gallons
--------	---------------

Usable	_____ Gallons
--------	---------------

Near the fuel gauges OR fuel transfer pumps;

Model 235/320/360;

Do Not Take-off With Less Than	8 Gallons in Header Tank
--------------------------------	--------------------------

Near the header tank gauges;

Airspeed Limitations	Max Indg Gear Ext Speed.... 122 Kts
	Max Flap Ext Speed..... 100 Kts
	Max Full Flaps..... 100 Kts

In front of the pilot;

In addition, the following are some recommended placards:



These placards can be photocopied, and laminated if desired and then pasted in a desirable location by the owner. It is recommended that all switches and circuit breakers also be labeled, and a dymo marker works well for that task. Further it is desirable to place all labels and placards such that all text is visible by the pilot when sitting in the cockpit seat. Seat belt must be installed and canopy opening placards should be visible by both occupants.

**Latch Canopy Before Take-off.
DO NOT OPEN IN FLIGHT**

Near each canopy latch;

**Turn Strobe OFF when Taxiing in
Vicinity of Other Aircraft, or When
Flying in Fog/clouds, Standard Position
Lights to be Used for All Night Operations**

If strobe equipped;

Lined writing area consisting of 25 horizontal lines.

NOTES:

FANCAIR[®]
235 320 360

Handwritten notes area consisting of 25 horizontal lines. Three punch holes are visible on the left side of the page.

NOTES:

Lined writing area with 20 horizontal lines.

NOTES:

FANCAIR[®]
235
320
360

Lined area for notes, consisting of approximately 28 horizontal lines.

NOTES: