Normal Procedures

Section IV

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SAFE OPERATING AIRSPEEDS

NOTE

All airspeeds in this section are indicated airspeeds (IAS) and assume zero instrument error. You should make sure your system has been correctly calibrated and account for those errors as necessary.

NOTE

BEST AIRSPEEDS WILL VARY BASED ON INDIVIDUAL BUILDERS' AIRCRAFT

Max Demonstrated X-WIND Component - 20 kts

Take-off Speeds

Flaps UP (Model 235=faired, may need 5° down to compensate for flap below-up)
(Model 320 - 5°-10° Down)
Rotation, Model 235 - 52 KIAS (60 MPH)
Rotation, Model 320/360 - 56 KIAS (65 MPH)

Best Angle of Climb - V_x, 75KIAS (85 MPH)
Best Rate of Climb - V_y, 95KIAS (109 MPH)
Cruise Climb - 125 KIAS (140 mph)

Landing Approach

Flaps DOWN - 100 MPH
Flaps UP (0° deg, faired) - 115 MPH

Balked Landing Climb - 95 KTS

PREFLIGHT INSPECTION

COCKPIT - (Checklist)

ITEM	CONDITION
1. Control Lock	**REMOVE**
2. Landing Gear Switch	**DOWN**
3. Battery Switch	**ON**
4. Landing Gear Position Indicators	**3-GREEN**
5. Fuel Quantity	**CHECK**
6. Lights (If night flight)	**CHECK**
7. All Switches	**OFF**

WALK AROUND INSPECTION - (Checklist)

(Starting at Left Wing/Fuselage)

	ITEM	CONDITION
1.	Left Flap Attachments	SECURE
2.	Left Aileron	TRIM TAB PIN - SAFETIED
	Control Hinge	SECURE, NO LOOSE SCREWS
	Motion	FREE
	Span Edges	NO CONTACT WITH TIP OF FLAP
3.	Wing Tip	NO DAMAGE, CRACKED PAINT, SECURE
4.	Lt. Wing Up'r/Lwr surface	SIGHT- SMOOTH, NO BUCKLING/DISTORTION
	Leading Edge Feel	SMOOTH, NO DAMAGE, CLEAN
	Fuel Quantity	ADEQUATE FOR FLIGHT, CAP SECURE
	Pitot head	NO OBSTRUCTIONS (CHECK HEAT IF IFR)
5.	Left Main Gear	
	Tire	CONDITION/TREAD
	Chocks	REMOVED
	Brake Pads	CONDITION
	Brake Line	NO CHAFING
	Springs	SECURE
	Gear Doors	NO CRACKS, LINKAGE SECURE BUT FREE
	Tank Sump	DRAINED
6.	Left Nose Area	
	Tank Sump	DRAIN, CHECK FOR CONTAMINATION
	Tire	CONDITION/TREAD
	Chocks	REMOVED
	Strut	3 TO 4 INCHES EXTENSION
	Cowling	SECURE
	Cooling intakes	NO OBSTRUCTIONS, BIRD NESTS, ETC.

WARNING

Always assume the propeller is "Hot" and the engine ready to start when handling the propeller regardless of mag switch position.

CAUTION

*** See Propeller manufacturers instructions for nick and damage treatments and limitations. Damaged propellers are dangerous - failures can be catastrophic.**

ITEM	CONDITION
7. Propeller*/Spinner	
Secure, no cracks at attach screws	SPINNER
LE smooth, no nicks (dress as req'd)*	BLADES
8. Right Nose Area	
Oil Quantity	7 QUARTS MINIMUM
Dip Stick	SECURE
Inspection Door	CLOSED/SECURE
9. Right Main Gear	
Tire	CONDITION/TREAD
Chocks	REMOVE
Brake Pads	CONDITION
Brake Line	NO CHAFING
Springs	SECURE
Gear Doors	NO CRACKS, LINKAGE SECURE BUT FREE
Tank Sump	DRAINED
10. Right Wing	
Upper/Lower surface	SIGHT- SMOOTH, NO BUCKLING/DISTORTION
Leading Edge	FEEL- SMOOTH, NO DAMAGE, CLEAN
Fuel Quantity	ADEQUATE FOR FLIGHT, CAP SECURE
11. Wing Tip	NO DAMAGE, CRACKED PAINT, SECURE
12. Right Aileron	
Control Hinge	SECURE, NO LOOSE SCREWS
Motion	FREE
Span Edges	NO CONTACT WITH TIP OR FLAP
13. Right Flap	
Attach Points	CK SECURE
14. Right Fuselage	
Static Port	CLEAN, NO OBSTRUCTIONS
15. Tail Assembly	
Horizontal Stabilizer	NO LEADING EDGE DAMAGE
Vertical Stabilizer	NO LEADING EDGE DAMAGE

ITEM	CONDITION
Elevator/Rudder	FREE MOTION, NO RUBBING
Hinges	SECURE
Rudder cables	SECURE, NO BENDING OF CABLE TO FITTING

BEFORE STARTING - (Checklist)

1.	Baggage	Stowed, loose items SECURED
2.	Rudder Pedals	ADJUSTED
3.	Seat Belts/Shoulder Harness	Adjusted & SECURE
4.	Brakes	Check and Hold
5.	Circuit Breakers	Checked and IN
6.	Master Switch	OFF
7.	Avionics Master Switch	OFF
8.	Avionics Switches	OFF
9.	Gear Switch	DOWN
10.	Canopy	LATCHED

STARTING - (Checklist)

1.	Master Switch	ON
2.	Fuel Quantity	CK, COMPARE WITH VISUAL CHECK
3.	Carburetor Heat/ Alternate Air	OFF
4.	Mixture	RICH
5.	Throttle	OPEN 1/4 INCH
6.	Propeller	IN (MAX RPM)
7.	Boost Pump	CHECK OPERATIONS
8.	Prime	AS REQUIRED
9.	Clear Propeller	CALL "CLEAR"
10.	Magneto	BOTH (AT CRANKING SPEED)
11.	Starter	ENGAGE
12.	Throttle	ADJUST TO 1000 RPM
13.	Oil Pressure	CHECK (WITHIN 30 SEC OR SHUTDOWN)
14.	Alternator	ON
15.	Radios/Avionics	ON (AS REQ'D)

COLD STARTING

Cold starts are similar to normal starts except that more fuel may be required. For temperatures below 0°F preheating of the engine may be desirable as well as use of a warm battery. Care must be used to limit operation of the starter motor to 30 seconds for each 4 minutes of time to allow internal windings to cool. Also oil pressure will take longer than normal to indicate.

FLOODED ENGINE - (Checklist)

1. Mixture	**CUT-OFF**
2. Propeller	**HIGH RPM**
3. Throttle	**1/2 OPEN**
4. Mags	**BOTH**
5. Starter	**ENGAGE**
6. Upon start, Throttle	**IDLE (~1000 RPM)**
7. Mixture	**RICH**

HOT STARTING

Starting a hot engine can be difficult. This is particularly true with fuel injected engines and is generally due to vapor lock in the fuel system. All engines vary in their starting characteristics within the same models due in part to technique. Installation effects, fuel, battery condition etc. can all play a part. Cold engines will have one starting characteristic, another when hot after 10 or 15 minutes, and perhaps another after 30 minutes or so. Some experimentation and taking notes as to the technique that works, as well as advice from others who operate the same model engine can be helpful.

NOTE

Be sure to allow adequate cooling periods between starting attempts and avoid long continuous perioids of cranking as damage to the starter will result.

WARNING

Should a backfire occur during any start, continue cranking to draw any fire back into the engine. If backfiring continues or an engine compartment fire starts, shut down and EXIT the aircraft. Use fire extinguisher to extinguish any fire.

PRE-TAXI CHECKS - (Checklist)

1. Clear aft area for personnel and aircraft prior to power application (propeller blast) — "CLEAR"
2. Brakes — CHECK (at initial movement)

PRE TAKE-OFF RUN-UP - (Checklist)

1. Canopy — LOCKED
2. Area — CLEAR (Clear for prop, clear for prop blast)
3. Brakes — SET
4. CHT/Oil Temp — GREEN
5. Throttle — 1800 RPM
6. Propeller (controllable) — CYCLE TWICE
7. Mags — CHECK (Max 175 drop, 50 rpm difference)
8. Throttle — IDLE, then 1000 rpm
9. Suction — CHECK (4.8 - 5.2 in. Hg.)

BEFORE TAKE-OFF - (Checklist)

1. Canopy — LOCKED (4 places, recheck)
2. Seat Belts/Harness — SECURE
3. Instruments* — CHECK
4. Fuel Quantity — CHECK (Header FULL)
5. Oil Press/Temp — CHECK, GREEN
6. Breakers — IN
7. Master Switch — ON
8. Avionics Master — ON
9. Radios — ON & SET
10. Auto Pilot — OFF
11. Transponder — TO Standby
12. Propeller — FULL IN (Max RPM)
13. Mixture — FULL RICH
14. Boost Pump — As Desired

15.	Fuel Transfer Pumps	**OFF**
16.	Trims	**SET** (Aileron neutral, Elevator Take-off)
17.	Flaps Set	**TAKE-OFF** (235 = faired to 5°, 320 = 5°-10° below faired)
18.	Controls Free	**CHECK** (Proper throw and directions)

* NOTE: Allow enough time the gyro instruments to fully erect. A minimum of five (5) minutes is recommended, eight (8) minutes if IMC conditions exist.

RUNWAY CHECKS - (Checklist)

1.	Strobes	**ON**
2.	Transponder	**ON**
3.	Approach and T.O. Area	**CLEAR**
4.	Clearance from Tower	RECEIVED AND **ACKNOWLEDGED**
5.	Takeoff Runway	**CLEAR**
6.	Time Off	**NOTE**

TAKE-OFF & CLIMB - (Checklist)

1.	Take-off Power	**2700 RPM**
2.	Oil Temperature	**140°F MINIMUM**
3.	Cylinder Head Temperatures	**150°F MINIMUM**
4.	Check Eng Instruments **after** Power Application	
5.	Check Flight Instruments	**OPERATING**
6.	Rotate	**65 - 75 KTS**
7.	Initial Climb	**95 KTS**
8.	Upon Positive Climb, Landing not poss.	**GEAR UP**
9.	At ≈ 700 feet AGL	**FLAPS UP**
10.	Reduce Power	**2500 RPM**
11.	Mixture	**LEAN FOR CLIMB***
12.	Cylinder Head Temps	**500°F MAXIMUM**
13.	Oil Temperature	**240°F MAXIMUM**

Note: These numbers are typical. Check for your specific engine and aircraft.

CRUISE - (Checklist)

1.	Throttle	**SET**
2.	Propeller	**SET**
3.	Mixture	**LEAN AS REQ'D***
4.	Header Fuel	**MONITOR, MAINTAIN 1/2 OR GREATER**

NOTE

- GENERAL LEANING RULES-

The following are excerpts from the Lycoming Engine Operating Handbook and should be generally applicable for all engines.

A. Never exceed the maximum cylinder head temperature limits.

B. For maximum service life, CHTs should be maintained below 435°F (224°C) during high performance cruise operations and below 400°F (205°C) for economy cruise powers.

C. Maintain "Full Rich" for Take-off, climb, and cruise power settings of above 75% power. For take-off from high altitude airports, if engine roughness is noted, lean only enough to obtain smooth operation. Be alert for temperature rise. This is most likely to occur at altitudes over 5000 feet.

D. Always return to full rich **before** increasing power settings.

E. Operate the engine at maximum power mixture for performance cruise powers and at best economy mixture for economy cruise power.

F. During let-down flight operations it may be necessary to manually enrichen uncompensated carbureted or fuel injected engines to obtain smooth operation.

G. On turbocharged engines never exceed 1650°F turbine inlet temperature (TIT) with standard turbochargers.

H. Changes to cruise altitudes and/or power settings require the mixture to be reset.

NOTE

The following guidelines reflect recommended proceduires with the specified equipment. It is prudent to know each method in case of equipment failure.

LEANING, EXHAUST GAS TEMPERATURE

1. Normally aspirated engines with fuel injectors or uncompensated carburetors.
   a. Maximum Power Cruise (Approx 75% power) - 150°F on rich side of peak EGT for best power. Monitor cylinder head temperatures.
   b. Best Economy Cruise (Approx 75% power and below) - Operate at peak to 50° lean of peak EGT

LEANING FLOWMETER

Lean to the applicable fuel-flow tables or lean to an indication marked for correct fuel flow for each power setting.

LEANING, MANUAL MIXTURE CONTROL

(Economy cruise, 75% power or less, without flowmeter or EGT gauge)

Carbureted Engines

1. Slowly move mixture control from "Full Rich" position towards lean position.
2. Lean until engine roughness is observed.
3. Enrich until engine runs smoothly and power is regained.

Fuel Injected Engines

1. Slowly move mixture control from "Full Rich" towards lean position
2. Continue leaning until slight loss of power is noted (this may or may not be accompanied by roughness)
3. Enrich until engine runs smoothly and power is regained

USE OF CARBURETOR HEAT/ALTERNATE AIR

Carburetor Heat

The use of carburetor heat can be required during moist air operations when ambient temperatures range from 20°F to 90°F. This temperature decrease can cause the condensation of this moisture to form as ice in the intake passages and restrict airflow into the engine. The ice forms generally on the butterfly valve and is observed by a drop in manifold pressure or rpm or both.

To avoid this, all installations must be equipped with a system to preheat the incoming air and replace the heat lost due to vaporization. This is called carburetor heat. While the heated air melts or avoids the icing condition, it also reduces the amount of power available due to the commensurate reduction in air density, and also tends to move engine operation toward detonation range. Generally this heated air also avoids any filter in the intake system thus exposing the engine to particulates which may be present.

Ground operations should only confirm the operation of the Carburetor Heat system.

Take-offs should be made in the "Cold" position as during these high powers the possibility of icing is considered remote, and power is lost when using "Heat".

Climbs at 80% power and above should also be made "Cold". Should icing be suspected due to climbs thru IMC conditions, use heat sparingly and in conjunction with leaning of the mixture only enough to obtain smooth engine operation.

During flight operations operate in the Cold position however be alert for loss of power. This will be evidenced by engine roughness, an otherwise unaccountable loss in manifold pressure or RPM, or all three, depending on whether a constant speed or fixed pitch propeller is installed on the aircraft. If ice is suspected apply full carburetor heat and open the throttle to limiting manifold pressure and RPM. This will result in a slight additional drop in manifold pressure which is normal, and this drop will be regained as the ice is melted out of the induction system. When the ice has been cleared, return to the cold position. If a carburetor air temperature gauge or carb ice warning system is installed, partial heat may be used to keep the mixture above 32°F.

WARNING

It is not advisable to operate at partial heat without a carburetor air temperature gauge. Use full or no heat.

Landing Approaches should normally be conducted in the full cold position. Where ice is suspected, apply full heat however be alert that should an abort occur, the heat control should be moved to full cold immediately after full power is achieved.

Alternate Air

Fuel injected engines avoid most of the problems associated with carburetor icing as the fuel is injected under pressure at or near the intake valve, a relatively warm location and generally free of freezing conditions. Alternate air systems are provided to avoid filter or intake duct icing and in operation generally utilize air from a compartment of warmed air. Accordingly, manifold pressure will decrease and a power loss will be noted. High power settings are thus to be avoided lest detonation occur with its resulting damage to the engine. Bypassing of the filter also allows contaminated air to enter the engine similar to carburetor heat. Alternate air, like carburetor heat, should be considered a minimum use, and only when required condition.

ADDITIONAL CHECKLISTS

The use of written checklists is the safest means of insuring that all items in a sequence are covered and acted on correctly. Their use is a sign of maturity and professionalism. Those provided herein for the Lancairs are for your convenience. Modifications may be required for your particular aircraft.

DESCENT - (Checklist)

1. Master Switch	**ON**
2. Mags	**BOTH**
3. Header Fuel	**FULL**
4. Fuel Pumps	**OFF**
5. Altimeter	**SET (FOR BARO OR FIELD ELEVATION)**
6. Mixture	**ENRICHEN THRU DESCENT OR FULL RICH**
7. Power	**AS REQ'D (USE CAUTION, AVOID RAPID AND EXCESSIVE COOLING)**
8. CHTs	**MAINTAIN GREATER THAN 180°F**

PRE-LANDING - (Checklist)

1. Seat Belts/Shoulder Harness	**FASTENED**
2. Header Tank	**1/2 OR MORE**
3. Mixture	**RICH**
4. Landing Gear	**DOWN (122 KTS MAX), 3-GREEN**
5. Flaps	**FULL (100 KTS)**
6. Propeller	**HIGH RPM**
7. Brakes	**CHECK**
8. Establish	**NORMAL APPROACH**

BALKED LANDING - (Checklist)

1. Throttle	**FULL**
2. Airspeed	**95 KTS, ESTABLISH CLIMB**
3. Flaps	**RETRACT**
4. Gear	**RETRACT**

AFTER LANDING - (Checklist)

(After turning off runway)

1. Flaps	**UP**
2. Strobes	**OFF**
3. Transponder	**OFF**
4. Lights	**AS REQUIRED**
5. Trim	**RESET FOR TAKE-OFF**
6. Time	**NOTE**

SHUTDOWN - (Checklist) (At parking site)

1. Radios	**OFF**
2. Avionics Master	**OFF**
3. Throttle	**1000 RPM**
4. Mixture	**IDLE CUT-OFF**
5. Mags (After engine stops rotating)	**OFF**
6. Lights	**OFF**
7. Master Switch	**OFF**
8. Chocks/Tiedown	**COMPLETE**

ABBREVIATED TAKE-OFF CHECKLIST - (CIGAR)

Controls	**FREE AND CORRECT**
Instruments	
Gear Switch	**DOWN**
Circuit Breakers	**IN**
Altimeter	**SET**
Directional Gyro	**SET**
Radios	**SET**
Engine Instruments	**IN GREEN**
Gas	
Shut Off	**OPEN**
Boost	**AS DESIRED**
Transfer Pumps	**OFF**
Fuel Pressure	**CHECK**
Header Tank	**FULL**
Mixture	RICH

Attitude
- Canopy — Latched
- Seat Belts/Harness — SET
- Flaps — SET, 235 = faired, 320 = 5°-10° Down
- Trim — SET
- Autopilot — OFF

Run-up
- Brakes — SET
- Nose wheel — Straight
- Mag Check — 1800 RPM, 175 max each, 50 rpm difference
- Propeller — 2 CYCLES
- Oil Pressure — IN GREEN

ABBREVIATED LANDING CHECKLIST - (GUMP)

Gas
- Header Tank — FULL
- Boost — AS DESIRED
- Transfer Pumps — OFF
- Fuel Pressure — CHECK

Under Carriage
- Gear — DOWN, 3-GREEN (122 kts max)
- Flaps — FULL, @ 100 kts (114 mph)

Mixture
- Mixture Control — RICH

Prop
- Propeller Control — HIGH RPM (In)

HEATING & VENTILATION

Cooling air. Your Lancair is typically equipped with simple air intake scoops for cabin ventilation. Accordingly a simple open/closed valve is used to control air flow thru the intake scoop.

Heating. Cabin heat is provided by means of an intake system using air warmed by passing over/thru a heat exchanger where exhaust gases are used as the heat source. This air-to-air heat exchanger provides air which is either dumped overboard, or into the cabin. Due to the potential of a leak from the higher pressure exhaust gases containing Carbon Monoxide (CO) into the fresh air side of this heat exchanger, it is necessary to inspect the structural integrity of the unit periodically. Initial operation of the system for the winter months should always include such an inspection. A monitoring system should be considered for the cabin air. These simple devices change color upon exposure to CO. They are quite cheap, and excellent insurance against the effects of this odorless, colorless, and deadly gas.

COLD WEATHER OPERATIONS

PREFLIGHT INSPECTIONS

Winter preflight inspections of the aircraft need to account for the accumulation of frost or ice on the exterior of the aircraft. The Lancairs with their extraordinary smoothness can suffer markedly from the effects of such accumulations as they utilize laminar flow airfoils. These effects result in significantly higher drag of the airframe and wings as well as reduced lift and increased weight of the accumulation. Once these deposits have been removed (preferably by warming in a hangar) the preflight should include special emphasis on freedom of control movements.

ENGINE CONSIDERATIONS

Very cold temperatures require extra considerations for engine starting and operations. The engine oil will be significantly more viscous resulting in higher oil pressures, slower indication upon starting, increased engine wear, tappet noise (if equipped with hydraulic lifters) poor battery performance, etc.

During extreme cold weather it may be necessary to preheat the engine, oil and battery before starting. Since the engines are cooled by pressurized air created in flight, ground operations must be minimized at high ambient temperatures and conducted with care at all times.

Engine operations should be into the wind when possible. The mixture should be RICH. Avoid prolonged idling and do not exceed 2200 rpm on the ground. Warm up should be at 1000-1200 rpm. The engine is warm enough for take-off when the throttle can be opened without faltering. Take-off with a turbocharged engine should not be started if indicated lubricating oil pressure, due to cold temperatures is above maximum. Excessive oil pressure can cause overboost and consequent engine damage.

CRUISE OPERATION

Cold weather cruise operation may require an occasional cycle of the propeller control. This could be particularly true after long duration cruise just prior to descent where lack of governor control could cause overspeeding. During descents and landing, give special attention to cylinder head temperatures, since the engine will easily over cool.

ICING CONDITIONS

Flight in icing conditions is prohibited.

Should ice be inadvertently encountered it can be expected that drag will increase, possibly markedly, stall speeds will increase, again possibly significantly, and extreme care must be exercised while ice is present on the airframe. It is prudent to avoid icing conditions if at all possible.

NOISE

All approaches and departures should be made with noise considerations second only to safety. More and more areas are becoming noise sensitive and our consideration of such areas will prolong our ability to operate in a friendly community environment. It is preferable to avoid rather than overfly such areas. Where necessary to overfly, do so at reduced power if prudent and overfly at 2000 feet AGL or higher.

NOTE

The above suggestions are recommended where they do not conflict with weather conditions, ATC clearances or instructions, or where in the judgment of the pilot, they can be complied with safely.

No flyover noise level has been established for these Lancair aircraft, as defined by FAR 36 requirements, nor has the FAA determined that the noise level of these airplanes is considered acceptable or unacceptable for operations into or out of any airport.

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