Pilot’s Operating Handbook and Airplane Flight Manual

Lancair IV-P N4XE

Built by John Olszewski

# Revision History

4/18/2009 First established POH

12/2/2009 Established stall speed (Vso) at 74 KIAS after test flight after paint

Corrected fuel capacities

Reformatted Table of Contents

# General

The original Lancair POH was significantly modified to reflect the aircraft that was built. Material was also extracted from the following sources:

Lancair ES N58WP which was available in digital format,

Columbia 400 POH with Garmin 1000 instrument panel.

The airspeeds quoted are given conventional nomenclature, are shown in knots, calibrated airspeed, and assumes zero instrument error.

## FAA Requirements

This aircraft is FAA approved in the **EXPERIMENTAL** category based on FAR 21 and 23. Although not required that a current Handbook be in the airplane during flight, it is highly recommended that the pilot operate the aircraft with and within the limits identified in this Handbook as well as placards located in the Aircraft.

It is the operator’s responsibility to maintain the Handbook in a current status.

## Conventions

The use of a **Warning** symbol means that information which follows is of critical importance and concerns procedures and techniques which could cause or result in personal injury or death if not carefully followed.

The use of a **Caution** symbol means that information which follows is of significant importance and concerns procedures and techniques which could cause or result in damage to the airplane and/or its equipment if not carefully followed.

The use of a **Note** symbol means the information that follows is essential to emphasize.

The words **shall** and **will** are used to denote a mandatory requirement. The word **should** denotes something that is recommended but not mandatory. The word **may** is permissive in nature and suggests something that is optional. The meaning of **land as soon as possible or practicable** relates to the urgency of the situation. When it is suggested to land as soon as possible, this means to land at the nearest suitable airfield after considering the weather conditions, ambient lighting, approach facilities, and landing requirements. When it is suggested to land as soon as practicable, this means that the flight may be continued to an airport with superior facilities, including maintenance support, and weather conditions.

## 

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## Three-View drawing of Airplane

LIV_3view_dimR.tiff

## Descriptive Data

### Power Plant Specifications

|  |  |
| --- | --- |
| **Engine** | Teledyne/Continental TSIO-550  Six cylinder, Horizontally Opposed,  Fuel Injected, Twin turbo-charged,  Twin inter-cooled |
| **Horsepower** | 350 hp. @ 2700 rpm  (Recommended TBO 1600 hrs) |
| **Propeller** | 3 blade 76” diameter, constant speed |
| **Power Loading** | 9.1 lbs./hp. |

### Size Specifications

|  |  |
| --- | --- |
| **Length** | 25 ft. |
| **Wing Span** | 35.5 ft. |
| **Wing Area** | 108 sq. ft. |
| **Wing Loading**  **@ Max Gross** | 34.7 lbs./sq. ft. |
| **Aspect Ratio** | 9 : 1 |
| **Endurance** | 4.5 hrs. |

### Weight Specifications

|  |  |
| --- | --- |
| **Empty Weight** | 2396 lbs. |
| **Gross Weight** | 3750 lbs. |
| **Max Landing Weight** | 3350 lbs. |
| **Fuel Capacity** | 89 gal. (Useable) |
| **Useful Load** | 1104 lbs. |
| **Useful Load (full fuel)** | 579 lbs. |

### Cabin and Baggage Specifications

|  |  |
| --- | --- |
| **Cabin Length** | 126 in. |
| **Cabin Height** | 48 in. |
| **Cabin Width** | 46 in. – Front  43 in. – Rear |
| **Baggage Compartment Max.** | 150 lbs. |
| **Baggage Compartment Vol.** | ~ 13.5 cu. ft. |
| **Seats** | 4 |

### Performance Specifications

|  |  |
| --- | --- |
| **Take-Off Distance** | Ground Roll 1500 ft. |
| **Landing Distance** | Ground Roll 1700 ft. |
| **Fuel Consumption** | 18 – 22 gal/hr |
| **Max Range** | 1550 sm. with reserve |
| **Endurance** | 4.5 hrs. |
| **Flight Levels** | 75% Power @ FL250 |

### Fuel Specification

Minimum grade Aviation Gasoline conforming to ASTM D910-76 & MIL-G-5572, latest regions are approved.

* 100 (Green)
* 100LL (Blue)

|  |  |
| --- | --- |
| **Total Fuel Capacity** | 92 gals  46 gals/wing |
| **Unusable Fuel** | 1.5 gals  .75 gals/wing |

### Oil Specification

|  |  |
| --- | --- |
| **Total Oil Capacity** | 12 qts |
| **Drainable Oil** | 10 qts |

* **Specification o**r Oil Grade **(the first 25 engine hours)** – Non-dispersant mineral oil conforming to SAE J1966 shall be used during the first 25 hours of flight operations. However, if the engine is flown less than once a week, a straight mineral oil with corrosion preventative MIL-C-6529 for the first 25 hours is recommended.
* **Specification or Oil Grade (after 25 engine hours)** – Teledyne Continental Motors Specification MHS-24 or MHS-25. An ash-less dispersant oil shall be used after 25 hours.
* **Viscosity Recommended for Various Average Air Temperature Ranges -**

Below 40°F (4°C) - SAE 30, 10W30, 15W50, or 20W50

Above 40°F (4°C) - SAE 50, 15W50, or 20W50

## Abbreviations, Terminology & Symbols

### Airspeed Terminology

|  |  |
| --- | --- |
| **CAS** | Calibrated Air Speed is the indicated speed of an airplane, corrected for position error and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level. |
| **GS** | Ground Speed is the speed of an airplane relative to the ground. |
| **IAS** | Indicated Air Speed is the speed of the airplane as shown on the airspeed indicator when corrected for instrument error. The IAS values that are published in the manual assume zero instrument error. |
| **KCAS** | Calibrated Air Speed in knots. |
| **KIAS** | Indicated Air Speed in knots. |
| **TAS** | True Airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature, and compressibility. |
| **VA** | Maneuvering Speed is the maximum speed at which application of full available aerodynamic control will not over stress the airplane. |
| **VFE** | Maximum Flap Extended Speed is the highest speed permissible with wing flaps in the prescribed extended position. |
| **VLE** | Maximum Landing Gear Extended Speed is the maximum speed at which an airplane can be safely flown with the landing gear extended. |
| **VN** | Maximum Level Speed at full power. |
| **VLO** | Maximum Landing Gear Operating Speed is the maximum speed at which the landing gear can be safely extended or retracted. |
| **VNE** | Never Exceed Speed is the speed limit that may not be exceeded at any time. |
| **VNO / VC** | Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air, and then only with caution. |
| **VS** | Stalling Speed or the minimum steady flight speed at which the airplane is controllable. |
| **VSO** | Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration. |
| **VX** | Best Angle of Climb Speed is the airspeed which will deliver the greatest gain of altitude in the shortest possible horizontal distance. |
| **VY** | Best Rate of Climb Speed is the airspeed which will deliver the greatest gain in altitude in the shortest possible time. |
| **MMD** | Maximum Mach number. |

## Meteorological Terminology

ISA - International Standard Atmosphere in which:

1. The air is a dry perfect gas.
2. The temperature at sea level is 15 ° C (59 ° F)
3. The pressure at sea level is 29.92 In. Hg. (1013.2 millibars)
4. The temperature gradient from sea level to altitude at which the outside air temperature is -56.5 ° C (-69.7 ° F) is -0.00198 ° C ((-0.003566 ° F) per foot and zero above that altitude.

OAT (Outside Air Temperature) -

The free air static temperature, obtained either from in-flight temperature indicators adjusted for instrument error and compressibility effects, or ground meteorological sources.

Indicated Pressure Altitude –

The number actually read from an altimeter when the barometric subscale has been set to 29.92 In. Hg. or 1013.2 millibars.

Pressure Altitude –

Altitude measured from standard sea level pressure (29.92 In. Hg.) by a pressure or barometric altimeter. It is Indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero. Position errors may be obtained from the Altimeter Correction Graph.

Station Pressure –

This is the actual atmospheric pressure at the field elevation.

Wind –

The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

## Power Terminology

**Take-Off / Maximum Continuous –**

The highest power rating that is not limited by time.

**Cruise Climb –**

The power recommended for cruise climb.

## Engine Controls & Instruments Terminology

**Throttle Control –**

This is used to control power by introducing fuel-air mixture into the intake passages of the engine. Settings are reflected by readings on the manifold pressure gauge.

**Propeller Control –**

This control requests the propeller to maintain engine/propeller rpm at a selected value by controlling blade angle.

**Mixture Control –**

This control is used to set fuel flow in all modes of operation and cuts off fuel completely for engine shutdown.

**EGT (Exhaust Gas Temperature) –**

This indicator is used to identify the lean and best power fuel flow for various power settings.

**CHT (Cylinder Head Temperature) –**

The indicator used to identify the operating temperature of the engine’s cylinders.

**TIT –**

The temperature of the exhaust gases as they enter the respective turbo-charger.

**Tachometer –**

This indicates the rpm of the engine/propeller.

**Propeller Governor –**

This regulates the rpm of the engine/propeller by increasing or decreasing the propeller pitch through a pitch change mechanism in the propeller hub.

## Performance & Flight Planning Terminology

### Climb Gradient –

The ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.

Demonstrated Crosswind Velocity –

This is the demonstrated crosswind velocity of the crosswind component for which adequate control of the airplane during take-off and landing was actually demonstrated. The value shown is considered to be limiting. The value in this handbook is that demonstrated by Lancair test pilots and considered safe.

### MEA –

This is the minimum enroute IFR altitude.

### Route Segment –

This is part of a route. Each part is identified by one of the following:

1. A geographic location.
2. A point at which a definite radio fix can be established.

### GPH –

Gallons per hour fuel flow.

### PPH –

Pounds per hour fuel flow.

## Weight and Balance Terminology

### Reference Datum –

This is an imaginary vertical plane from which all horizontal distance are measured for balance purposes.

### Station –

This is a location along the airplane fuselage usually given in terms of distance from the reference datum.

### Arm –

This is the horizontal distance from the reference datum to the center of gravity (CG) of an item.

### Moment –

This is the product of the weight of an item multiplied by its arm. This is often scaled by a constant multiplier to reduce number of digits.

### Airplane Center of Gravity (CG) –

The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moments by the total weight of the airplane.

### CG Arm –

The arm obtained by adding the airplane’s individual moments and dividing the sum by the total weight.

### CG Limits –

This defines the extreme center of gravity locations within which the airplane must be operated at a given weight.

### Usable Fuel –

This is the fuel available for flight planning purposes.

### Unusable Fuel –

Fuel remaining after a run out test has been completed in accordance with governmental regulations.

### Standard Empty Weight –

This is the weight of a standard airplane including unusable fuel, full operating fluids, and full oil.

### Basic Empty Weight –

This is the Standard Empty Weight plus any optional equipment.

### Payload Weight –

This is the weight of occupants, cargo, and baggage.

### Useful Load –

This is the difference between the maximum take-off weight, or the maximum ramp weight if applicable, and the basic empty weight.

### Maximum Ramp Weight –

Maximum weight approved for ground maneuvering. (It includes weight of start, taxi, and run-up fuel).

### Maximum Take-Off Weight –

Maximum weight approved for the start of the Take-Off roll.

### Maximum Landing Weight –

Maximum weight approved for the landing touchdown.

### Zero Fuel Weight –

This is the weight exclusive of usable fuel.

### Tare –

The weight of the chocks, blocks, stands, etc. when used on the scales when weighing an airplane.

### Jack Points –

These are the designated points on the airplane that have been identified by the manufacturer as suitable for supporting the airplane for weighing or other purposes.

# Limitations

## General

The airspeeds quoted are given conventional nomenclature, are shown in knots, calibrated airspeed, and assumes zero instrument error.

## Aircraft Operating Speeds

|  |  |  |
| --- | --- | --- |
| Speed | Marking | KCAS |
| **Never Exceed Speed** | VNE – Red Line | 274 |
| **Caution, smooth air only** | Yellow Arc | 220-274 |
| **Maneuvering Speed** | VA | 170 |
| **Normal Operating Range** | VNO Green Arc | 69-220 |
| **Flap Operating Range** | 0-10 Deg | 174 |
| **Flap Operating Range** | VFE White Arc | 61-132 |
| **Best Angle of Climb** | VX | 110 |
| **Best Rate of Climb** | VY | 135 |
| **Stall Speed clean** | VS | 80 |
| **Stall Speed Landing Configuration** | VSO | 71 |
| **Landing Gear Operating Speed** | VLO (down) | 150 |
| **Landing Gear Operating Speed** | VLO (up) | 120 |
| **Landing Gear Extended Speed** | VLE | 165 |
| **Maximum demonstrated x-wind component.** |  | 25 |

## Power-plant Operating Limitations

|  |  |
| --- | --- |
| **Max Continuous** | BHP = 350 (-0. + 5)  RPM = 2700 |
| **Max Continuous Manifold Pressure** | 38 In. Hg. |
| **Recommended Climb** | BHP = 262  RPM = 2500 |
| **Recommended Climb Manifold Pressure** | 31 In. Hg. |
| **Cylinder Head Temperatures – ° F** | Max – 460  At Max Cruise (380-420) |
| **Oil Temperatures – ° F** | Max – 240  Take-Off Min – 120  At Max Cruise (160-200) |
| **Oil Pressure – PSI** | Normal 30-60  Idle Minimum 10  Max (Cold Oil) 100 |
| **Fuel Pressure – Unmetered PSIG** | Idle @ 700 RPM 7.0 – 9.0  Take-off 32-34 |

## Power-plant Instrument Markings

|  |  |  |
| --- | --- | --- |
| Specification | Marking | Value or Range |
| **Oil Temp Caution** | Yellow Arc | 210-240 ° F |
| **Oil Temp Normal** | Green Arc | 160-200 ° F |
| **Oil Temp Max** | Red Line | 240 ° F |
| **Oil Temp Take-Off Min** |  | 100 ° F |
| **Oil Pressure Min** | Idle Red Line | 10 PSI |
| **Oil Pressure Caution** | Yellow Arc | 10-30 PSI |
| **Oil Pressure Normal** | Green Arc | 30-60 PSI |
| **Oil Pressure Max** | Red Line | 100 PSI |
| **TIT Normal** | Green Arc | 1000 – 1650 ° F |
| **TIT Max** | Red Line | 1750 ° F  1850 ° F for 30 Sec |
| **CHT Normal** | Normal Range | 240 – 420 ° F |
| **CHT Max** | Red Line | 460 ° F |
| **Tachometer Normal** | Green Arc | 600-2700 RPM |
| **Tachometer Max** | Red Line | 2700 RPM |
| **Manifold Pressure Normal** | Green Arc | 15-38 In. Hg. |
| **Manifold Pressure Max** | Red Arc | 38 – 38.5 In. Hg |
| **Fuel Pressure Normal** | Green Arc | 7-34 PSIG |
| **Fuel Pressure Max** | Red Line | 34 PSIG |
| **Fuel Flow Normal** | Green | 10 – 25 GPH |
| **Fuel Flow Max** | Red Line | 40 GPH |

## Miscellaneous Instrument Markings

|  |  |
| --- | --- |
| Specification | Value or Range (PSI) |
| **Nominal Hydraulic Pressure** | 1100 |
| **Accumulator Pre-Charge** | 600 |

## Weight Limits

|  |  |
| --- | --- |
| Specification | Limit (lbs) |
| **Maximum Take-Off Weight** | 3750 |
| **Maximum Landing Weight** | 3400 |
| **Maximum Baggage Weight** | 150 |

## Center of Gravity Limits (Gear Extended)

The allowable Center of Gravity (CG) range is from Fuselage Station (FS) 86.5 to (FS) 94.5 inches or 8.0 to 27.5% MAC.

## Aft Limit

The aft CG limit is at FS 94.5 inches and must be considered a firm limit. Loads which place 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.

## Reference Datum

The Datum is located at FS 0.0. This can be located by measuring 51.25 in. forward of the bottom forward face of the firewall.

## Mean Aerodynamic Chord

The MAC corresponding to the CG limits of 86.5 and 94.5 are 8.0% and 27.5% respectively.

## Load Factor Limits

|  |  |
| --- | --- |
| **Flaps Up** | +8.8 to -4.5 g’s ultimate  +4.4 to -2.3 g’s allowable |
| **Flaps Down** | +3.8 to -2.0 g’s |

## General Limits

### Tire Pressures

|  |  |
| --- | --- |
| **Nose** | 32-35 PSI |
| **Main** | 55-65 PSI |

### Oxygen Pressure

|  |  |
| --- | --- |
| **Maximum** | 2000 PSI |

## Instrument Limits

### G900 System Limits

1. The database version is displayed on the MFD power-up page immediately after system powerup and must be acknowledged.
2. IFR enroute, oceanic and terminal navigation predicated upon the G900 GPS Receiver is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved navigation data.
3. Instrument approach navigation predicated upon the G900 GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment database. The GPS equipment database must incorporate the current update cycle or be verified for accuracy using current approved navigation data.
4. Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.
5. Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the G900 GPS position data is not authorized.
6. Use of the G900 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be valid on the PFD display.
7. When an alternate airport is required by the applicable operating rules, the aircraft must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.
8. VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee step-down fix altitude protection, or arrival at approach minimums in normal position to land. VNAV also does not guarantee compliance with intermediate altitude constraints between the top of descent and the waypoint where the VNAV path terminates in terminal or enroute operations.
9. If not previously defined, the following default settings must be made in the “SYSTEM SETUP” menu of the G900 prior to operation (refer to Pilot's Cockpit Reference Guide for procedure if necessary):
10. DIS, SPD kt (sets navigation units to “nautical miles” and “knots”)
11. ALT, VS ft fpm (sets altitude units to “feet” and “feet per minute”)
12. MAP DATUM WGS 84 (sets map datum to WGS-84, see note below)
13. POSITION deg-min (sets navigation grid units to decimal minutes) example: dd.mm.ss: 45° 30’ 30” in decimal minutes are: 45° 30.5’

NOTE

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the G900 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the G900 prior to its use for navigation.

1. Operation is prohibited north of 70°N and south of 70°S latitudes. In addition, operation is prohibited in the following two regions: 1) north of 65°N between 75°W and 120°W longitude and 2) south of 55°S between 120°E and 165°E longitude.

### GXT 33 Mode S Transponder Limits

1. Display of TIS traffic information is advisory only and does not relieve the pilot responsibility to “see and avoid” other aircraft. Aircraft maneuvers shall not be predicated on the TIS displayed information.
2. Display of TIS traffic information does not constitute a TCAS I or TCAS II collision avoidance system.
3. The FARs states that “When an Air Traffic Control (ATC) clearance has been obtained, no pilot-in-command (PIC) may deviate from that clearance, except in an emergency, unless he obtains an amended clearance.” Traffic information provided by the TIS up-link does not relieve the PIC the responsibility to see and avoid traffic and receive appropriate ATC clearance.

### EFIS Lite Limits

### Sorcerer Autopilot Limits

## Types of Operations and Limits

When the required equipment is installed and operational and operations are conducted as defined in this limitations section this aircraft is approved for:

1. VFR Day and Night
2. IFR Day and Night

Warning:

1. Flight Operations with passengers for hire is prohibited.
2. Flight into known icing is prohibited.
3. Intentional Spins are prohibited.

## Fuel Quantities

This aircraft has the extended fuel option with a capacity of 110 US gal. The usable fuel capacity is 102 gal.

## Fuel Management

Do not take-off with less than 10 US gal. in each tank. There is no interconnection between the wing tanks.

## Seating

The aircraft accommodates 4 adult occupants. Fully functional controls allow the aircraft to be flown from either front seat.

## Winter Operations

Winter operations are acceptable with proper oil grades for the operating temperatures. Engine pre-heating is recommended when the ambient temperature is below freezing.

# Placards

## General

## Interior Placards

## Exterior Placards

## AOA

These are on the right wing.





# Emergency Procedures

The emergency procedures are included before the normal procedures, as these items have a higher level of importance. The owner of this handbook is encouraged to copy or otherwise tabulate the following emergency procedures in a format that is usable under flight conditions. Plastic laminated pages printed on both sides and bound together are preferable. Such a checklist is included as part of the airplane’s delivery package. Complete Emergency Procedures Checklists shall be carried in the aircraft at all times in a location that is easily accessible to the pilot-in-command.

Many emergency procedures require immediate action by the pilot-in-command, and corrective action must be initiated without direct reference to the emergency checklist. Therefore, the pilot-in command must memorize the appropriate corrective action for these types of emergencies. In this instance, the Emergency Procedures Checklist is used as a crosscheck to ensure that no items are excluded and is used only after control of the airplane is established. When the airplane is under control and the demands of the situation permit, the Emergency Procedures Checklist should be used to verify that all required actions are completed.

In all emergencies, it is important to communicate with Air Traffic Control (ATC) or the appropriate controlling entity within radio range. However, communicating is secondary to controlling the airplane and should be done, if time and conditions permit, after the essential elements of handling the emergency are performed.

Note:

All airspeeds in this section are indicated airspeeds (KIAS) and assume zero instrument error.

## Emergency Airspeeds (kts)

|  |  |  |
| --- | --- | --- |
| **Emergency Decent** | Idle Power  Gear & Flaps up | 170-274 |
| **Best Glide** |  | 120 |
| **Landing Approach without power** |  | 120 |
| **AOA** | Max L/D |  |

## Engine Power Loss during Take-Off & Not Airborne

### Sufficient Runway Remaining:

|  |  |
| --- | --- |
| **Throttle** | Closed |
| **Brakes** | Apply as needed |
| **Stop straight ahead** |  |

### Insufficient Runway Remaining:

|  |  |
| --- | --- |
| **Throttle** | Closed |
| **Brakes** | Apply as needed |
| **Mixture** | Idle Cut-Off |
| **Fuel Selector** | Off |
| **Master Switches** | Both Off |
| **Magneto’s** | Off |

Maintain directional control and maneuver to avoid obstacles.

## Engine Power Loss during Take-Off & Airborne

### Sufficient Runway Remaining:

|  |  |
| --- | --- |
| **Airspeed** | 120 kts |

Maintain directional control and land straight ahead.

### Insufficient Runway Remaining:

|  |  |
| --- | --- |
| **Airspeed** | 120 kts |
| **Throttle** | Closed |
| **Mixture** | Idle Cut-Off |
| **Fuel Selector** | Off |
| **Propeller Control** | Low RPM |
| **Master Switches** | Both Off |
| **Magneto’s** | Off |
| **Flaps** | As Required |

Maintain directional control and make only shallow turns to avoid obstacles.

## If sufficient altitude has been gained to attempt a Restart:

|  |  |
| --- | --- |
| **Airspeed** | 120 kts |
| **Fuel Selector** | Fullest Tank |
| **Mixture** | Rich |
| **Throttle** | Intermediate Setting |
| **Magneto’s** | Cycle then Both On |
| **Boost Pump** | High Arm then try Low |
| **Flaps** | As required. |

Warrning

If the high fuel pump comes on it may signal an engine driven fuel pump emergency. Proper leaning procedures are important. During the descent and approach to landing phases of the flight, DO NOT set the mixture to full rich as prescribed in the normal before landing procedures, and avoid closing the throttle completely. If a balked landing is necessary, coordinate the simultaneous application of mixture and throttle.

Note:

If power is restored and there is any doubt as to the cause of the engine power loss, land at the nearest airport and determine the cause.

### In Flight:

|  |  |
| --- | --- |
| **Airspeed** | Climb to reduce speed to 120 kts |
| **Pick landing site** |  |
| **Attempt Restart** |  |
| **Communications** | Emergency 121.5 |
| **Transponder** | 7700 |

## Rough Running Engine

|  |  |
| --- | --- |
| **Mixture** | Rich |
| **Boost Pump** | Low if altitude > 10000 ft. |
| **Magneto’s** | Cycle then Both On |
| **Mixture** | Adjust |

## High Oil Temperature

Prolonged high oil temperature indications will usually be accompanied by a drop in oil pressure. If oil pressure remains normal, a high temperature indication may be caused by a faulty connection or thermocouple. If the oil pressure drops as temperature increases, proceed as follows:

|  |  |
| --- | --- |
| **Airspeed** | Increase |
| **Power** | Reduce  If the previous step does not lower temperature |

CAUTION

If these steps do not restore oil temperature to normal, an engine failure or severe damage can result. In this case it is recommended that the aircraft manufacturer's emergency instructions be followed.

## Low Oil Pressure

If the oil pressure drops without apparent reason from normal indication of 30 to 60 psi, monitor temperature and pressure closely. If oil pressure drops below 30 psi, an engine failure should be anticipated. Land a soon as possible and prepare for an off airport landing if necessary.

## Fire in Flight

### Electrical Fire:

|  |  |
| --- | --- |
| **Avionics Master** | Off |
| **Master Switches** | Both Off |
| **Battery Buss Breakers** | Off |

If smell clears, turn on equipment in a logical fashion and try to determine the source. If it can not be identified then **land as soon as possible and correct the problem**.

### If the fire continues:

|  |  |
| --- | --- |
| **Throttle** | Idle |
| **Mixture** | Idle Cut-Off |
| **Fuel Selector** | Off |
| **Boost Pump** | Off |
| **Land immediately and exit the aircraft** |  |

## Engine Fire during Start

|  |  |
| --- | --- |
| **Starter** | Continue Cranking |
| **Mixture** | Idle Cut-Off |
| **Throttle** | Full Open |
| **Boost Pump** | Off |
| **Fuel Selector** | Off |

## Emergency Decent

|  |  |
| --- | --- |
| **Throttle** | Idle |
| **Speed Brakes** | Deploy |
| **Propeller Control** | High RPM |
| **Airspeed** | 170 – 274 kts |

Caution: Do not Exceed VNE

## Maximum Glide Configuration

|  |  |
| --- | --- |
| **Gear** | Up |
| **Flaps** | Up |
| **Propeller Control** | Feather |
| **Airspeed** | 120 kts |
| **AOA** | Max L/D configuration. |

The best glide is 120 kts, FPM descent resulting in a glide ratio.

Glide distance is approximately NM per 1000 ft. of altitude loss, however this can vary significantly.

## Landing Emergencies

When a landing site has been selected and you are committed to landing off field, the following checklist can be completed. The use of gear **Up** versus gear **Down** is a function of the landing site. If the site is hard and smooth, a gear **Down** landing should be made, but if the site is soft or rough, a gear **Up** landing. When assured of reaching the landing site area:

|  |  |
| --- | --- |
| **Seat Belts & Harness** | Tight |
| **Door Seal** | Deflate |
| **Gear** | As needed |
| **Boost Pump** | Off |
| **Fuel Selector** | Off |
| **Magneto’s** | Off |
| **Flaps** | Down |
| **Master Switches** | Both Off |
| **Airspeed** | Decrease to touchdown |

Attempt to fly the aircraft and keep the wings level through the approach and landing until the aircraft comes to rest. Exit the aircraft and remain clear until assured there is no possibility of fire.

## Carbon Monoxide Detection

|  |  |
| --- | --- |
| **MFD System Soft Key** | Press |
| **CO RST Softkey** | Press |
| **Pressurized Air** | Off |
| **Airspeed** | Increase > 120 KIAS |
| **Oxygen** | DON |
| **Flight** | Land as soon as possible. |

## Broken or Stuck Throttle Cable

With enough power for continued flight:

|  |  |
| --- | --- |
| **Continued Flight** | Land as soon as possible |
| **Airport Selection** | Adequate for power off approach. |
| **Descent** | Control with Propeller Control |
| **Approach Speed** | 120 KIAS |
| **Seats, Belts, Shoulder Harnesses** | Adjust and Lock |
| **Fuel Selector Valve** | Fullest Tank |
| **Pressurization Controller** | Set to Dump |
| **Gear Down** | 3 Green lights |
| **Mixture** | Rich |
| **Wing Flaps** | 0 – 40 Deg when < 132 KIAS |
| **AOA** | Cross check with airspeed. |
| **Trim** | Adjust rudder and elevator trim |
| **Speed Brakes** | Closed |
| **Wheel Brakes** | Check |
| **Airspeed** | 100 KIAS & Flaps Down when runway is assured. |
| **Mixture** | Idle Cut-Off when descent with no power is assured. |

## Propeller Over-Speed

The controllable pitch propellers with the McCauley governors utilize oil pressure from the governor to increase pitch (low RPM), others may operate in the opposite manner. It is dangerous to run any engine over its rated rpm limit and thus the method to reduce any over-speed is to immediately reduce the throttle to idle and reduce airspeed to the point where RPM control is regained. Slowly add throttle and hold airspeed well below that at which the over-speed occurred. Mixture may need to be adjusted for smooth operation. If the over-speed was significant, an engine inspection is called for upon landing. Engine operation for the balance of the flight must be monitored closely.

## Propeller Damage

As with any major component of an aircraft, the propeller demands proper care. Nicks, scratches, and other types of damage require care. These nicks cause stress concentrations to a greater or lesser degree which can be dangerous. The loss of any portion of a blade can be catastrophic.

## Electrical System Failure

The electrical system of this aircraft is a key component to the safe operation during flight and is required during all flight operations. The battery will read approximately 24.8 volts on a full charge and 28+ on the alternator. If you experience alternator failure:

|  |  |
| --- | --- |
| **Master Switches** | Both Off then Both On  (This will reset the breakers) |
| **Avionics Master** | Off |
| **Lights** | Off |

Turn on the master switches and other equipment in an orderly fashion and monitor the alternator status closely.

If an over voltage is detected, try to determine which alternator is causing the problem then leave it off and engage the cross-over. The alternators can be cycled by turning of the respective Alternator Breakers from the MFSC.

If one buss shows low voltage than that likely indicates an alternator failure. Engage the cross-over.

## Lightning Strike

In order to prevent as much damage as possible to the electrical system, components, and avionics in the event of a lightning strike, surge protection has been built into the aircrafts electrical system. This surge protection comes from large MOVs (metal oxide varistor) installed near the circuit breakers behind the instrument panel. The aircraft has one MOV on the essential bus and one on each of the main busses. It is imperative that after a lightning strike, the MOVs are replaced before the next flight.

CAUTION

After a lightning strike, the MOVs must be replaced before the next flight.

If the aircraft is struck by lightning in flight, the MOVs will have likely prevented significant damage to the electrical components. The most likely damage will be to the equipment on the extreme ends of the airplane, such as the strobe and anti-collision lights. After the lightning strike, the pilot should reset all tripped circuit breakers. If any of the circuit breakers trip a second time, they should not be reset. The pilot should then determine which equipment is operating properly, and adjust the flight accordingly.

## Trim or Auto-Pilot Failure

This is indicated by a sudden or unexplained change in control stick force.

|  |  |
| --- | --- |
| **Flight** | Manually Control the aircraft. |
| **Auto-Pilot** | Disconnect |
| **Trim** | Turn off Breaker on MFSC |
| **Power Setting** | Reduce to 50% BHP or less with an airspeed that relieves forces. |
| **Flight** | Terminate the flight as soon as practicable or possible. (This depends on the magnitude of control force(s) required to maintain a normal flight attitude.) |
| **Landing** | Prepare for control force changes. (When power is reduced and airspeed is reduced, there can be substantial changes in the required control pressures.) |

WARNING

In a runaway trim emergency the two most important considerations are (1) IMMEDIATELY turn off the trim system and (2) maintain control of the airplane. The airplane will not maintain level flight and/or proper directional control without pilot input to the affected flight control(s). If excessive control force is required to maintain level flight, land as soon as possible. Pilot fatigue can be increased significantly in this situation with the potential for making the landing difficult.

## Speed Brakes

If the speed brakes should fail in the open (deployed) position, attempt to retract them by cycling to full open and then closed. Disabling the breaker should cause them to close (collapse).

If all attempts fail to retract them, land with them fully extended and use 110 KIAS on final. Testing has shown that the Lancair has sufficient roll control to safely fly with one speed brake extended, and the other fully retracted, again, final approach speed should be 110 KIAS minimum.

## Landing Gear

The landing gear is held up with hydraulic pressure. A pressure switch shuts off the hydraulic pump when the system pressure (1100 psi) is achieved. If hydraulic pressure is lost the nose gear will free fall, and with the aid of a gas strut will lock in the down position, the main gear will fall to a vertical position and with the aid of the emergency gear blow-down, will be locked into the down position. Emergency extension is accomplished as follows:

|  |  |
| --- | --- |
| **Airspeed** | Below 120 kts |
| **Gear Motor Solenoid Breaker** | Off |
| **Gear Handle** | Down |
| **Emergency blow down valve** | Open |

Once lowered it is not advisable to attempt a retraction prior to landing and determining the cause of the failure.

Warning:

Aircraft observers must be used with caution as not all pilots have the training to safely fly in **Formation** and may not be sufficiently familiar with the gear in the down and locked configuration.

## Unlatched Door in Flight

If the door becomes unlatched or opens in flight the first priority is to **Fly the Airplane**. If the door is still hooked, have a passenger hold the handle to prevent further opening. If the door has completely opened, do not attempt to close it. Slow the airplane down to approach speed, extend the flaps, and land at the nearest airport.

Warning:

If the cabin is pressurized and the door is not completely latched, any movement of the door handle toward the unlocked position may cause loss of pressurization and opening of the door.

1. If the cabin door is ajar it may not be secure.
2. Depressurize cabin (consider altitude before depressurizing cabin).
3. Do not attempt to check cabin door for security until cabin is depressurized and airplane is on the ground.

## Inadvertent Icing

|  |  |
| --- | --- |
| **Detection** | Check Surfaces for evidence of structural icing. |
| **Pitot Heat**  Propeller Heat | On  On |
| **Course** | Reverse Course |
| **Altitude** | Change to a level where the temperature is above freezing. |
| **Defroster** | Divert all heated air to the defroster. |
| **Propeller Control** | Increase Higher RPMs will mitigate ice accumulation. |
| **Manifold Pressure** | Monitor – A drop in manifold pressure may be an indication of induction icing. Increase throttle as required. |
| **Heated Induction Air** | ????? |
| **Alternate Static Source** | Open if static source icing is evident or suspected. |
| **Flight Characteristics** | ADD MARGIN OF SAFETY (An ice buildup on the wings and other surfaces will increase stalling speeds. Add a margin to approach and landing speeds.) |
| **Approach Speed** | Appropriate for the amount of ice accumulation and flap setting. If there is a heavy ice buildup on the windshield, a gentle forward slip or small S-turns may improve forward visibility by allowing use of the side windows. |
| **Landing Attitude** | LIMITED FLARE (Land at a higher speed and in a flat attitude sufficient to prevent the nose wheel from touching the ground first.) |

## Spins

Spins are prohibited!

If a spin is entered inadvertently or intentionally, the stick should be neutralized or placed slight forward of neutral. The rudder should be held against the direction of the spin until rotation is stopped. At this point, the recovery should be flown with a smooth, positive pullout of no more than 4 g’s, taking particular care not to enter an accelerated stall or re-enter another spin.

Warning:

This aircraft is aerodynamically very clean and can loose a lot of altitude in this maneuver.

## Emergency Speed Reduction

The nature of this emergency must be considered before action is taken, but in general the power should be reduced to idle, nose up, speed brakes deployed, gear extended below 150 KIAS and the most critical would be the extension of the wing flaps after reaching 132 KIAS (VFE).

## Loss of Pressurization

**In the event of cabin pressurization loss at high altitude: use Oxygen or Descend as required.**

# Normal Procedures

## Preflight Inspection Checklist

### Cabin

|  |  |
| --- | --- |
| **Pitot Cover** | Remove and Store |
| **Control Lock** | Remove |
| **Gear Switch** | Down |
| **Magnetos** | Off |
| **Master Switches** | Both On |
| **Gear Indicators** | 3 Green |
| **Pitot Heat** | On for 30 seconds for pre-flight testing. |
| **Fuel Quantity Indicators** | Check Quantity. |
| **Flaps** | Down |
| **Lights** | Check Nav, Strobe, & Landing Lights. |
| **Master Switches** | Both Off |
| **Fuel Selector** | Fullest Tank |
| **Oxygen** | * Check Quantity * Masks Available * Verify Flow |
| **Door Seal** | Check Condition. |

### Empennage

|  |  |
| --- | --- |
| **Baggage Door** | Locked |
| **Static Port** | Cleared |
| **Tail Tie Down** | Disconnect |
| **Tail Control Surfaces** | Check freedom of movement and security. |
| **Static Wicks (5)** | Check for installation and condition. |

### Right Wing Trailing Edge

|  |  |
| --- | --- |
| **Main Gear Door** | Secure |
| **Wing Flap** | Check for movement and security. |
| **Aileron** | Check freedom of movement and security. |
| **Speed Brakes** | Condition |
| **Position Lights** | Check security and condition. |
| **Fuel Tank Vent** | Check that it is clear of obstructions. |
| **Static Wicks (2)** | Check for installation and condition. |

### Right Wing

|  |  |
| --- | --- |
| **Wing Tie-Down** | Disconnect |
| **Fuel Quantity** | Check visually for actual level. |
| **Pitot Tube** | Cover removed, clear, and heater working. |
| **AOA Pressure Port** | Check Condition |
| **AOA Drain Port** | Drain and Check Condition |
| **Fuel Filler Cap** | Secure |
| **Pitot Tube** | Remove Cover and check for obstructions. |
| **Main Gear and Tire** | Check for proper inflation and condition. |
| **Fuel Tank Sump** | Before the first flight of day and after each refueling, use a sampler cup and drain a small quantity of fuel from the quick drain valve to check for water, sediment, and proper fuel grade. |
| **Nose Gear Door** | Secure |
| **Nose Gear Well** | Check for general condition, leaks, and security of retraction and extension system. |

### Nose

|  |  |
| --- | --- |
| **Propeller and Spinner** | Check for nicks, security, and oil leaks. |
| **Landing Lights** | Check for condition and cleanliness. |
| **Air Inlets** | Check for restrictions or other foreign matter. |
| **Nose Gear and Tire** | Check for proper inflation and condition. |
| **Engine Oil Level** | Check |
| **Fuel Strainer** | Before the first flight of day and after each refueling drain a small quantity of fuel to check for water, sediment, and proper fuel grade. |

Warning:

Make certain that the magnetos are both **Off** and that no one is in or near the cockpit while performing this check. Hands pass through the prop arc, thus if the prop turns severe injury or amputation will occur.

### Left Wing

|  |  |
| --- | --- |
| **Main Gear and Tire** | Check for proper inflation and condition. |
| **Fuel Tank Sump** | Before the first flight of day and after each refueling, use a sampler cup and drain a small quantity of fuel from the quick drain valve to check for water, sediment, and proper fuel grade. |
| **Fuel Quantity** | Check visually for actual level. |
| **Fuel Filler Cap** | Secure |
| **Wing Tie-Down** | Disconnect |
| **Position Lights** | Check security and condition. |
| **Fuel Tank Vent** | Check that it is clear of obstructions. |

### Left Wing Trailing Edge

|  |  |
| --- | --- |
| **Static Wicks (2)** | Check for installation and condition. |
| **Speed Brakes** | Condition |
| **Aileron** | Check freedom of movement and security. |
| **Aileron Trim** | Check attachment and security, |
| **Wing Flap** | Check for movement and security. |
| **Main Gear Door** | Secure |

## Before Starting Checklist

|  |  |
| --- | --- |
| **Preflight Inspection** | Complete |
| **Seats, Belts, & Harnesses** | Adjust and Lock |
| **Fuel Selector Valve** | Fullest Tank |
| **Avionics** | Off |
| **Non essential equipment** | Off |
| **Brakes** | Test and Set |
| **Door** | Latched |

## Starting Checklist

|  |  |
| --- | --- |
| **Master Switches** | Both On, 3 Green Gear Lights |
| **Mixture** | Rich |
| **Propeller** | High RPM |
| **Throttle** | Open ½ in. |
| **Prime** | As required. |
| **Propeller Area** | Clear |
| **Magnetos** | Both On |
| **Ignition Switch** | Start (Release when engine starts) |
| **Oil Pressure** | Check |
| **Avionics** | On |
| **Parking Brake** | Off |

Note:

If engine has been over-primed, start with throttle ¼ to ½ open. Reduce throttle to idle when engine fires.

Note:

After starting, check for oil pressure indication within 30 seconds in normal temperatures and 60 seconds in cold temperatures, If no indication appears, shut off engine and investigate,

## Cold Starting

Use the same procedure as for a normal start, except that more primer will normally be necessary. After the engine begins running, it may be necessary to operate the primer intermittently for a few seconds in order to prevent the engine from stopping.

## Flooded Engine

Use the same procedure as for a normal start with the following exceptions:

|  |  |
| --- | --- |
| **Mixture Control** | Idle Cut-Off |
| **Throttle** | ½ Open |

When engine starts, retard the throttle and slowly advance mixture control to Full Rich.

## Hot Starting

Use the same procedure for normal start, except have mixture control at idle cut-off, throttle full open, and electric fuel pump on high for approximately 15 to 30 seconds.

## Before Taxi Checklist

|  |  |
| --- | --- |
| **Engine Indications** | Check |
| **MFD Volt & Ammeter** | Check |
| **MFD Fuel Remaining** | Initialize |
| **Radios and Avionics** | * Com Radios * Nav Radios * PFD and Backup Altimeters * FMS Flight Plan Loaded * Altitude and Heading bugs * Transponder * AOA Check |
| **Auto Pilot** | * Engage * Control Stick Forward Pressure – verify nose up trim after 3 seconds. * Control Stick Back Pressure – verify node down trim after 3 seconds. * Check Trim (should disconnect Auto Pilot) Verify operation in commanded direction. * Engage in HDG Mode – Change HDG Bug and verify stick movement. Reset HDG Bug. |
| **Speed Brakes** | Test |
| **Lights** | As Required |
| **Clearance** | As Required |

## Taxi Checklist

|  |  |
| --- | --- |
| **Brakes** | Check |
| **PFD & Backup** | Check for proper operation |
| **Turn Coordinators** | Check for proper operation |
| **Directional Gyros** | Check for proper operation |

## Ground Warm-Up

Teledyne Continental aircraft engines are air-cooled and are dependent on forward speed of the aircraft for cooling. To prevent overheating, it is important that the following rules be observed:

1. Head the Aircraft into the wind.
2. Operate the engine on the ground with the propeller in the **High RPM** position.
3. Avoid prolonged idling at low RPM. Fouled spark plugs can result from this practice.
4. Warm up 900 to 1000 RPM
5. Oil Door should be closed. (RTS More discussion on Oil Door!!!)

## Before Take-Off Checklist

|  |  |
| --- | --- |
| **Cabin Door** | Closed, Locked, and Seal inflated. |
| **Flight Controls** | Free and Correct |
| **Controls Trim** | Set Elevator, Rudder, and Aileron trim for Take-Off |
| **PFD & Backup** | Crosscheck and Verify |
| **PFD Alerts Softkey** | Press – Ensure aural warning stops. |
| **Fuel Selector** | Fullest Tank |
| **Mixture** | Rich |
| **Throttle** | 1700 RPM  Magnetos – Check; Drop < 150 RPM; differential < 50 RPM  Propeller – Cycle from High to Low RPM; Return to High RPM  Engine Instruments and Ammeter Check |
| **Idle** | Check; Then set to 1000 RPM |
| **Lights** | Nav, Strobe, Taxi lights as needed |
| **Transponder** | On/Alt |
| **Throttle Friction Lock** | Adjust |
| **Wing Flaps** | Set |
| **Pressurization By-Pass** | Push to Pressurize |
| **Temperature Valve** | Push for Cool air |
| **Pressurization Controller** | Set to On  Set cabin altitude to field elevation  Set rate |
| **Fuel Pump** | High Arm |
| **Parking Brake** | Off |
| **PFD Annunciation Window** | All Messages Addressed |

## Take-Off and Climb Checklist

### Normal Take-off

|  |  |
| --- | --- |
| **Wing Flaps** | 10 ° |
| **Power** | Smoothly apply full throttle.  Max 38 in. Hg and 2700 RPM |
| **Elevator Control** | Lift Nose wheel at 65 KIAS |
| **Climb Speed** | 110 KIAS with 10 Deg flaps (Vx)  Slowly retract flaps after reaching 100 KIAS  135 KIAS with flaps up (Vy) |

### Maximum Performance Take-off & Climb

|  |  |
| --- | --- |
| **Wing Flaps** | 20 ° |
| **Power** | Full throttle.  Max 38 in. Hg and 2700 RPM |
| **Brakes** | Release above 25 In. Hg. |
| **Elevator Control** | Lift Nose wheel at 65 KIAS |
| **Climb Speed** | 110 KIAS until all obstacles cleared (Vx)  Slowly retract flaps after reaching 100 KIAS  135 KIAS with flaps up (Vy) |

### Normal Climb

|  |  |
| --- | --- |
| **Airspeed** | 165 KIAS |
| **Power** | 31 in. Hg and 2500 RPM |
| **Fuel Selector** | As Desired |
| **Mixture** | Rich |
| **Fuel Pump** | Low Boost > 10000 ft.  High Arm otherwise |
| **Pressurization Controller** | Set for cruise altitude |

## Cruise Checklist

|  |  |
| --- | --- |
| **Power** | Set as desired |
| **Trim** | Adjust rudder and elevator trim |
| **Mixture** | Lean |
| **Fuel Pump** | Low Boost > 10000 ft.  Off otherwise |
| **Pressurization Controller** | Monitor |

## Descent Checklist

|  |  |
| --- | --- |
| **Pressurization Controller** | Set for pattern elevation |
| **Power** | Set as desired |
| **Trim** | Adjust rudder and elevator trim |
| **Fuel Pump** | Low Boost > 10000 ft.  Off otherwise |
| **Mixture** | Enrichen as required |
| **Speed Brakes** | Set as desired. |
| **Wing Flaps** | As Desired  0-10 Deg when < 170 KIAS  10-40 Deg when < 132 KIAS |

## Approach Checklist

|  |  |
| --- | --- |
| **Instrument Approach** | Loaded into Flight Plan |
| **PFD Baro Min** | Set |
| **GPS Rain/Map Integrity** | Verify |
| **PFD OBS/SUSP Softkey** | Review and Brief Usage for approach |
| **PFD CDI Button** | Select Nav Source |
| **Nav Aids** | Tuned and Identified |
| **Approach Course** | Set |
| **PFD and Backup Altimeter** | Set |

Note

Passing the FAF, a new course may be needed.

## Before Landing Checklist

|  |  |
| --- | --- |
| **Seats, Belts, Shoulder Harnesses** | Adjust and Lock |
| **Fuel Selector Valve** | Fullest Tank |
| **Pressurization Controller** | Set to Dump |
| **Airspeed** | 120 KIAS (Flaps Up) |
| **Gear Down** | 3 Green lights |
| **Wing Flaps** | 0 – 40 Deg when < 132 KIAS |
| **Airspeed** | 100 KIAS (Flaps Down) |
| **AOA** | Cross check with airspeed. |
| **Mixture** | Rich |
| **Propeller** | High RPM |
| **Auto-Pilot** | Disengaged |
| **Trim** | Adjust rudder and elevator trim |
| **Speed Brakes** | Closed  May be operated intermittently to modulate glide path |
| **Wheel Brakes** | Check |

## Balked Landing Checklist

|  |  |
| --- | --- |
| **Power** | Full throttle.  Max 38 in. Hg and 2700 RPM |
| **Wing Flaps** | Retract to 20 ° |
| **Gear** | Retract after positive rate of climb |
| **Airspeed** | 110 KIAS (Vx) |
| **Wing Flaps** | Retract Slowly |

## Normal Landing Checklist

|  |  |
| --- | --- |
| **Touchdown** | Main Wheels First |
| **Landing Roll** | Lower nose wheel slowly |
| **Braking** | Minimum Required |

## After Landing Checklist

|  |  |
| --- | --- |
| **Wing Flaps** | Up |
| **Transponder** | Off |
| **Lights** | As needed |

## Securing the Airplane Checklist

|  |  |
| --- | --- |
| **Door Seal** | Deflate |
| **ELT** | Verify not activated. |
| **Avionics** | Off |
| **Throttle** | Idle (4 minutes for cool down) |
| **Electrical Equipment** | Off |
| **Mixture** | Idle Cut-Off |
| **Magneto’s** | Off |
| **Master Switches** | Both Off |
| **Control Lock** | Install |
| **Tie Down** | As needed |
| **Pitot Cover** | As needed |
| **Canopy Cover** | As needed |

## 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 air frame 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 causing higher oil pressures, slower indication upon starting, increased engine wear, tappet noise, poor battery performance, etc.

During extreme cold weather it will be necessary to preheat the engine, oil and battery before starting. Do not start engine below 30° F. It is possible the main bearing may turn.

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 oil temperature has reached the minimum temperature. Refer to Limitations section for proper temperatures as they pertain to the engine.

## Cruise Operation

Cold weather 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 over speeding. 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.

# Weight & Balance and Equipment List

## General

Proper CG is absolutely critical to safe flight. This is where NO exceptions can be considered. You must verify that the center of weight is in the correct position and if it is not, you MUST correct it before flight.

WARNING

Do not attempt to use bathroom scales to calculate the center of gravity as they are not sufficiently accurate. Flying outside of the approved center of gravity enve­lope is dangerous. You should rent or borrow a good set of accurate beam scales or equivalent. These scales should be able to handle up to 1500 pounds each.

NOTE:

The allowable Center of Gravity range is FS 86.5 to FS 94.5 (8.0% to 27.5% MAC)

## Airplane Weighing Procedure

### Worksheet

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A  Wt | B  Tare  Wt | C  Net  Wt | D  Mom  Arm | E  Mon  Wt | Station |
| **Nose Gear** |  |  |  |  |  |  |
| **Rt. Main** |  |  |  |  |  |  |
| **Lt. Main** |  |  |  |  |  |  |
| **Empty CG** |  |  |  |  |  |  |

### Procedure

1. First establish the airframe's empty weight and its empty Center of Gravity (CG). The aircraft and the scales must be level while being weighed and preferably in a hangar with the doors closed to eliminate any wind effects. (If weighing outdoors, the wind must be virtually calm.) Shims (I x 4s or similar boards) may be required under the landing gear to establish this level attitude and these shims become part of the "tare weight." All tare weight is deducted from any scale readings.
2. Establish the "Reference Datum Point" (BL"0") from which ALL measurements can be made. The bottom firewall joggle is FS 51.25 and is easily located adjacent to the nose gear well. Drop a plumb bob line down from that point and mark it on the floor.
3. Establish an aircraft centerline on the floor by dropping a plumb bob point from the tail and "chalking" a line between the two points. Continue this line forward to locate BL "0".
4. Drop a plumb bob from the center of each wheel axle. Mark the nose gear axle center onto the ground at the centerline position. Mark the two main gear axle centers on the ground and extend a straight line between the two main gear crossing the fuselage centerline previously "chalked" onto the floor.
5. Next measure and record the distance from the Reference datum to the location of the nose and main gear as marked along the fuselage centerline. Log these distances in the appropriate lines of Column D, these are the "arms" or "moment arms."
6. Read and record the actual weights of the leveled aircraft on the three scales. Log these weights in the appropriate lines in Column A.
7. Log the weights of any shim stock (the 1 x 4s and any other non-aircraft weight) that is on the scales as tare in Column B.
8. Subtract the tare weights from the measured weights and place those figures in Column C.

You now have all the information required to establish the aircraft's empty Center of Gravity.

## Moment Weights

1. Now, to arrive at the "moment weights" of the nose gear and the main gear locations simply multiply the weight of the nose gear and main gear by the distance from the datum point and record the values in Column E.
2. Total Columns C & E separately.
3. Divide Column E by Column C and the result is the empty weight CG expressed as a distance from the datum point.

This empty weight CG must ultimately be forward of the allow-able flight CG range since when the pilot gets into the aircraft, he will be aft of this point and that will move the CG aft into the begin­ning of the allowable range. The empty CG should be such that the plane is in the most nose heavy condition i.e., at the front CG limit.

## Determine Load Point Stations

Before removing the aircraft from the scales, it is wise to also establish your exact moment arms for fuel and front and rear seats. Builder differences in relation to the exact location of the wing can change the CG of the fuel, and the pilot and passenger moment arms are affected by such items as seat back angles, cushions, etc. These are less defined and should be determined, not estimated.

To determine your pilot/front seat passenger moment arm have someone sit in the plane and log the resultant weight changes on the three scales, (ensure the seats are slid forward to their normal "flight" position). Now recalculate the pilot's moment arm. Repeat this process for the rear passenger seats.

To determine the CG of the fuel tanks, simply add 10-20 gal. of fuel in each tank, log the new weights and calculate the fuel CG. Use 5.9 lbs/gal to calculate the weight.

## Worksheet

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Calculation | Front  Seat | Rear  Seat | Baggage |
| **Test Weight (Measured) lbs.**  **Equals (B) + (C)** | (A) |  |  |  |
| **Delta Nose Weight lbs.** | (B) |  |  |  |
| **Delta Main Weight lbs.** | (C) |  |  |  |
| **Delta Nose Moment** | (D) = (B) \* Nose Arm |  |  |  |
| **Delta Main Moment** | (E) = (C) \* Main Arm |  |  |  |
| **Total Moments** | (F) = (D) + (E) |  |  |  |
| **Station Arm** | (F) / (A) |  |  |  |

### Example

Let's say you weigh 170 lbs. The net change on the nose gear was -50#) and the net gain on the main gear was 220# (170 + 50). Multiply the nose gear weight change (a negative number) and the main gear weight change by their respective moment arms. Combine those two numbers (moment weights) and divide by 170. (Remem­ber that the nose gear number is negative so it will subtract from the other.) The resultant figure is the moment arm for your body. Log that dimension as the pilot / front seat passenger moment arm.

This approach can be used to calculate accurately the remaining loading points, like the rear passengers, fuel and baggage.

## Measured and Calculated Weight and Balance (Per John Olszewski)

### Measured Weights – Empty

|  |  |  |
| --- | --- | --- |
| Item | Measure |  |
| Nose Gear Weight | 616.00 | lbs |
| Nose Gear Arm | 33.25 | inches |
| Nose Gear Moment | 20,482.00 | in-lbs |
| Left Main Gear Weight | 893.00 | lbs |
| Left Main Gear Arm | 106.75 | inches |
| Left Main Gear Moment | 95,327.75 | in-lbs |
| Right Main Gear Weight | 887.00 | lbs |
| Right Main Gear Arm | 106.75 | inches |
| Right Main Gear Moment | 94,687.25 | in-lbs |
|  |  |  |
| Total Weight | 2,396.00 | lbs |
| Total Moment | 210,497.00 | inches |
| Center of Gravity | 87.85 | in-lbs |

### Stations (By calculation)

|  |  |  |
| --- | --- | --- |
| Item | Arm | Maximum |
| Empty Weight | 87.85 inches |  |
| Fuel | 95.72 inches | 525.1 lbs |
| Front Seat Pilot & Copilot | 97.33 inches |  |
| Rear Seat Passengers | 129.10 inches |  |
| Forward Baggage | 144.00 inches | 150 lbs (combined) |
| Aft Baggage | 165.00 inches |

## Equipment List

The following equipment was included for Weight & Balance

|  |
| --- |
| Two Firewall Mounted 24V Concorde Batteries |
| Chelton / Sierra 3 screen EFIS system |
| Oxygen Bottle |
| TruTrak Sorcerer 3-Axis Auto Pilot |
| PM Engineering PMA9000EX Audio Panel |
| Garmin GMA 480 GPS integrated navigation and communication |
| Garmin SL70 Nav / Comm Radio |
| Advanced Flight Systems AOA Pro |
| Air Conditioner |
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|  |

# System Descriptions

## Materials

The aircraft is fabricated of high temperature prepreg Carbon Fiber skins over a Nomex honey-comb core. With the exception of a few parts, all preformed parts are vacuum bagged and oven cured at 250 ° F at a pressure of nearly 2000 lbs/sq. ft. These are similar to almost all modern commercial transport construction methods and materials meeting such standards regarding traceability and fire resistance, and the manufacturing equipment meet the FAA requirements. In addition the resin systems used are low in styrene and are safer to handle and use than most other systems.

## Flight Controls

The aircraft is conventional in its control configuration except for the side stick controls. The airfoils are a combination of NASA and NACA designs with unique airfoils specifically for this aircraft’s mission. All primary airfoils are High Laminar flow designs with non-critical characteristics. This means the airfoils are capable of maintaining laminar flow over 50-60% of their chord, generating greatly reduced drag. Should laminar flow be lost due to surface contamination (i.e. bugs, etc) no dramatic loss of lift is incurred.

## Trim Controls

This aircraft utilizes three axis electric trim. The elevator and rudder tabs are built into the control surface and the aileron tab is hinged on the trailing edge of the left aileron. The three trim motors are made by the [Ray Allen Company](http://www.rayallencompany.com/)

## Ground Control

The aircraft is controlled on the ground using differential braking to control the castering nose gear. A little caution for the first few flights in the aircraft is all that is required to get the feel of the simple and light weight approach. Caution should be exercised to not ride the brakes while taxiing, use only enough power to taxi at a brisk walking pace and try to only use the brakes as necessary for steering. Under normal conditions brakes are not needed for the take-off roll once the power if applied, as rudder control becomes effective above 25-30 kts.

## Flaps

The wing flaps are a full slotted fowler flap design and are operated from the landing gear hydraulic system. The Flaps are actuated with the flap handle on the center instrument panel below the throttle quadrant. They can be set to any desired position by simply moving the handle up or down and then returning the handle to neutral once they are set to where you want them.

## Speed Brakes

Wing mounted SpeedBrakes ™ manufactured by [Precise Flight Inc.](http://www.preciseflight.com/) provide expedited descents at low cruise power, enhanced glide path control, and as an aid to the prevention of engine shock cooling. The SpeedBrakes ™ has been tested to Vne and landings have been made with them deployed and full flaps.

Warning:

The SpeedBrakes ™ should not be used in the following situations:

* Forced landing after Engine Failure
* Spins
* Ditching
* Disabled Elevator systems
* Electrical Failures
* Icing

Testing has shown that the aircraft has sufficient roll control to safely fly with one speed brake extended and the other fully retracted. A maximum of 50% of corrective aileron travel and 30 lbs. of rudder pressure are required for coordinated flight at Vne.

In the case of inadvertent take off with speed brakes deployed, after the take off roll, expect some reduction in the rate of climb until the SpeedBrakes ™ are retracted.

In the case of inadvertent cruise with the speed brakes deployed, speed and range will be reduced approximately the same as if the gear was left extended.

## Landing Gear

The aircraft’s main landing gear is constructed of gun drilled tubular steel. The main gear is retracted into the fuselage via full rack and pinion gears driven by the hydraulic system. The wheels are 600x6 with heavy duty brakes.

The nose gear is a conventional air & oil eleo strut with internal viscous shimmy dampening. Retraction is accomplished with a separate hydraulic cylinder and shares the same hydraulic system as the mains. A dedicated gas strut is used for emergency extension.

Warning:

The nose-wheel shimmy dampener must be checked on a regular basis. This can be accomplished by placing the normally weighted nose wheel on greased metal plates and measuring the rotational resistance of the assembly. Air & Oil struts should have from 20 – 50 ft. lbs. of torque. Also check the rotation resistance of the wheel. If more than one free revolution of the wheel occurs after firmly spinning the tire, the axle bolt must be tightened.

The split nose gear doors are operated through the retract linkage, and are held open by a spring in the same linkage. The main gear outer doors are opened by springs in their mechanical linkage; The inner doors are opened by the main gear strut riding on a nylon track on the individual door. They are spring loaded toward the closed position and are held in the positive closed position in flight by a cable mechanism for the inner door and through a mechanical linkage for the smaller outer door.

## Gear Operation

In the down position, the nose gear is **over-centered** and the combination of the gas strut and the normal hydraulic pressure help hold it there. The main gear is held in the down position by a mechanical down link pin located in each hydraulic actuation cylinder.

Retraction of the gear is accomplished by moving the gear handle to the up position which unlocks the main gear down lock pins, then retracts all three landing gear. As the gear becomes fully retracted, the hydraulic system reaches its maximum pressure and a pressure switch shuts off the pump. The gear is held in the up position by hydraulic pressure.

A 600 PSI accumulator is installed in the hydraulic system to absorb pressure bumps. It also allows the flaps to be operated several times without the system pressure falling below the pump-on limit.

Emergency extension of the landing gear is accomplished by placing the gear handle in the down position, thus returning the up pressure to the reservoir and then operating the emergency hydraulic hand pump found between the pilot and copilot seats.

## Baggage Compartment

The baggage compartment is located directly behind the passenger seats. It’s capacity should never exceed 150 lbs.

Warning:

The aircraft weight and balance may limit the maximum baggage to less than the maximum stated herein.

All baggage carried should be secured for every flight. Even a flight in smooth air could encounter unexpected clear air or wake turbulence or require a evasive maneuver which could become a hazard to the flight anywhere from a nuisance to being catastrophic.

Warning:

Anticipate the likelihood of negative flight conditions for every flight!

## Seats, Belts, & Shoulder Harness

The aircraft is fitted with seat belts and for the front seat, shoulder harnesses. The seat cushions are used to fit the occupants into the plane comfortably and provide support in the case of high **G** emergencies. Each occupant should adjust the seat belts so they seat firmly for take-off and landing. The pilot should remain belted throughout the flight – immediate control of the aircraft is important. The shoulder harness is perhaps the greatest life saver for take-off and landing emergencies. Always make sure any uninitiated passengers know how to secure and release their belt and harness without relying on the pilot.

## Control Locks

RTS

## Engine

### General Information

This aircraft is fitted with a 350 HP continental engine and a constant speed propeller. The engine and propeller each as well as the combination are FAA certified. The engine has 6 cylinders in opposed configuration with magnetos for ignition, a starter, and dual alternators. Since this is the only source of power for flight, it make sense to treat it with the utmost care.

### Engine Controls

The engine is equipped with dual magnetos which are shorted in the Off position. It is mandatory that operation of the magnetos be checked prior to each flight. An RPM drop of approximately 100 RPM will be experienced for moderate power settings (1700 RPM) when operating on only one magneto. The engine speed variation between left and right magnetos should not exceed 50 RPM. Operation on either magneto should be smooth or the flight should be aborted and the problem resolved. The propeller should never rotated on the ground without assuming the magnetos are **hot** and the off position should be checked for operation by briefly switching the magnetos to the off position while at idle RPM prior to each shutdown. Normal shutdown is accomplished by putting the mixture control in the cut-off position.

The engine utilizes a throttle to control the airflow into the engine, restricting it with a butterfly (throttle) valve in the intake system. Full throttle allows unrestricted airflow into the engine.

Controllable propeller engines have a propeller control which controls the engine RPM. Maximum engine RPM at fill throttle settings are required for take-off. Cruise power settings reduce engine RPM commensurate with a reduced manifold pressure.

The fuel/air ratio is also controlled to compensate for the large air density changes due to operations at different altitudes. The mixture control reduces the fuel quantity provided to the engine from Rich to Lean and is varied by fuel flow versus power setting curves from the engine handbook to leaning based on measured engine exhaust gas temperatures (EGT) or Turbine Inlet Temperature (TIT). The latter provides maximum fuel economy and extended engine life. Take-off is at full rich at all times except for some high altitude and/or hot day conditions.

## Engine Instrumentation

Oil, the life blood in an engine, is of prime concern. Oil quantity is only measurable prior to flight and is a mandatory item in the checklist. Perhaps the most important measurement during operation is oil pressure. Oil temperature is another valuable measurement. Proper oil type and viscosity per the engine manufacturer’s recommendation must be used. This is particularly important for the breaking in of a new engine. This phase of an engine’s (or a cylinder’s) life requires a mineral oil and the use of high and variable power settings for the first few hours of operation. For specifics, see the manufacturer’s engine operating manual for recommendations.

**RPM.** Controllable propellers are adjusted (by changing pitch of the blades) to keep the engine RPM at the desired setting.

**CHT.** Cylinder head temperature is a measure of engine cooling or it’s effectiveness. Since the aircraft is tightly cowled, high power settings at low airspeeds (slow climb for example) should always be monitored for high CHT readings. Excessive CHT levels will result in damage and/or reduced engine life. Poor cooling can also result from improper baffles, a bird’s nest in the engine compartment, etc., and must be avoided.

**EGT & TIT.** A measure of optimum fuel/air ratio is available by sensing the temperature of the exhaust gases. Operating the engine at or near its peak exhaust temperature means that you are operating at the near optimum fuel/air ratio. Exhaust gas temperature is kept within limits indirectly by establishing the proper mixture for the specified power setting. Proper mixture adjustment can be monitored by EGT and TIT and will provide reduced fuel consumption, engine maintenance, and extended life. These measurements are likely to indicate a deteriorating engine situation that can be corrected before mechanical damages occur or a dangerous in-flight situation develops.

Fuel injected engines spray the fuel into the intake manifold or the near the intake valve and are less prone to form ice in the intake system since there is no temperature drop due to the fuel vaporization at the throttle valve.

RTS – Alternate air setup description here!

## Engine Starting

Starting the aircraft is simple. The aircraft is equipped with an electric starter which cranks the engine to provide the first of the three basic requirements: Air, Fuel, and Ignition. Fuel is introduced by a primer selection prior to cranking with the mixture control in the full rich position. Engage starter until the engine starts.

After the engine starts, adjust the RPM to approximately 1000 RPM and monitor the oil pressure. If no oil pressure is indicated with 30 seconds, shut down the engine and determine the cause. This time may be slightly longer under abnormally cold conditions or with the improper grade of oil in the engine. Under these conditions it is highly desirable to warm the engine and it’s oil prior to starting to minimize engine wear and ease starting. Very cold temperatures will increase the normal oil pressure and following starts the engine RPM should be kept at idle or slightly above until oil pressure starts returning to normal.

Warning:

The aircraft does not lend itself to hand starting due to it’s tricycle gear. This practice is very dangerous.

## Accessories

The engine is equipped with dual alternators as a source of electrical power to charge the dual batteries and operate various items during flight. Proper operation of the charging system is evident if the running system voltage is between 28 – 28.4 volts DC.

Since a charged lead-acid battery has a voltage of 24.2 to 24.8 volts the battery should be continuously charging while the engine is running. The amp meter may show a (-) battery discharge at low RPM conditions indicating that current for operating some of the aircrafts equipment is coming from the battery. As the engine RPM is increased the amp meter should show a (+) charge that may be close to zero indicating that the battery is being charged.

## Fire Detection & Extinguishing

No built-in fire detection is provided nor is an extinguishing system. It is prudent to carry a fire extinguisher in the aircraft. It should be checked regularly and kept in an easily accessible location. Starting an over-primed engine is the most likely time you may have a problem. If the engine backfires and catches fire, continue cranking the engine and attempt to draw the fire back into the engine where it belongs. If the radio is on, advise your situation. If cranking the engine is not successful, or cranking is not possible for some reason, introduce the contents of the fire extinguisher into the engine compartment via the cooling inlets and remain clear of the aircraft. While the aircraft is made of fire resistant materials and its fumes are essentially not-toxic, it is, nonetheless, a flying fuel tank and must be treated as such.

## Abnormal Operation

After a few hours of operating the aircraft you will become familiar with its operations from its flight control to its engine. It is good practice to make written notes of how it is operating so that you can spot changes. These may be towards stabilizing or deteriorating indications and need watching. From the engines standpoint, oil consumption for example will be high on a new engine and decrease over the first 15 – 50 hrs and then stabilize. From this point it should remain stable for many hours until the rings begin to deteriorate with an increase in oil consumption. Should piston rings begin to stick an increase in consumption will generally be noted and corrective actions or repairs can be effected in a timely manner. Continuous monitoring of engine parameters such as oil pressure, CHT, EGT (individual and spread), along with airspeed, altitude, temperature, and power setting for example will be rewarded by an intimate knowledge of your engine, as well as reduced maintenance and vastly increased reliability.

## Propellers

Care of the propeller is vitally important as it is a very highly stressed component. Loss of even a portion of a blade can be catastrophic in flight. Nicks and scratches cause stress risers and cannot be neglected. The repaired contour of any repair should be similar to the original contour to remain as close as possible to the original airfoil as before thus maintaining the same lift on each blade. In addition the repair must result in the nick being fully removed and the blade surface polished. Respect its overhaul periods! If in doubt, have it inspected by a certified propeller repair facility.

## Fuel System

Fuel is carried in the wing witch are integral with the wing structure. The wings hold 100 gal. (50 gal. for each wing). Each tank has a screen at it’s outlet and as a safety feature each wing tank incorporates a slosh bay to reduce the chance of unporting the fuel pickup in the event of a temporary uncoordinated maneuver such as a slip. The fuel is feed from the tanks through a fuel selector, a dual speed electric boost pump, the gascolator, and then the engine driven fuel pump.

The fuel valve offers left, right, and off positions as per FAA standards for a low wing aircraft. The fuel valve also automatically returns vapor return fuel to the selected tank.

The electric fuel pump is used for three purposes. At high altitudes, above FL100, the low range is selected to minimize the chance of fuel vapor generation in the fuel system. The high range is used in case of an engine driven pump failure. This aircraft has a Low, Off, and High Arm selection for the electric fuel pump. The Low and Off are obvious. The High Arm is used in take-off, climbs, and cruise flight phases. In this mode if the fuel pressure drops below 5.5 PSI the high fuel pump is engaged and latched on until turned off. It should not be turned on during any time the engine power is reduced below normal cruise power. Any reduction in engine power might momentarily drop the fuel pressure and inadvertently engage the fuel pump in the high mode. With less than cruise power there is a potential to flood the engine and cause it to stop. The fuel pump is also used to prime the engine and perform vapor suppression prior to engine start.

## Hydraulic System

A self contained hydraulic system is used to operate the landing gear and wing flaps. The pump is electrically powered. When the gear up position is selected, the hydraulic pressure (nominally 1100 psi) is applied to the up side of the landing gear pistons raising the gear. The hydraulic pump will cycle to maintain the hydraulic pressure. Upon selecting the down position the hydraulic pressure is provided to the down side of the landing gear pistons lowering the gear. The nose gear will be driven to the over-center locked position, and the mains will have the integral gear down pins engaged.

The wing flaps operate from the same system and in a similar manner. The flap control has three positions: Flaps Up, Flaps Down, and maintain current position. Any flap position can be obtained by timing the actuation of the flap switch between the different positions.

Proper servicing is required to maintain trouble free operation. Use only MIL-L-5606 red hydraulic fluid and remember that with hydraulics, cleanliness is next to godliness. The slightest contamination can damage the piston seals and cause the check valves to not operate properly.

## Brake System

Steering of the aircraft on the ground is by the use of differential brakes. The rudder pedals incorporate independent toe brake cylinders operating heavy duty Cleveland type disk brakes on the main gear. The brakes are provided on both the pilot and co-pilot rudder pedals. Brakes should be checked each time you leave the ramp prior to taxiing. Care should be used to not ride the brakes unnecessarily by using only sufficient power to maintain taxi speed. Also, you should get in the habit of checking your brakes on downwind before landing. To do so, simply depress each pedal to verify a firm pedal.

The aircraft also provides a parking brake capability. To use depress each pedal to obtain a firm pedal, then engage the parking brake.

## Electrical System

The electrical system consists of dual alternators, dual batteries, and dual master busses. In addition there is a battery bus that can be powered from either battery, even when the master busses are disabled; and an essential bus that is powered when either or both of the master busses are enabled. The ability to tie the two master busses together in the case of a battery and/or alternator failure is available as well as the ability to supply the aircraft with external power.

When any bus is un-powered (disabled) all of the electronic breakers on that bus that may have previously tripped on an overload will be reset and available when the bus is subsequently powered (enabled). The breakers can still be manually turned on or off and will retain this setting when the bus is cycled between the disabled and enabled states.

The magneto circuits are independent of the electrical system and each other. Instrument panel switches are provided to control the magnetos.

An instrument panel switch is used to control the battery buss.

# Instrument Panel and Cockpit Layout

## Aircraft Lighting

The aircraft is equipped with LED navigation lights, anti-collision strobe lights, halogen taxi and landing lights, instrument, cabin, and baggage compartment lighting. All of these are controlled from the MFSC.

## Door & Door Seal System

The cabin door is fitted with an inflatable rubber seal that seals the door to the frame. The motor and pump are mounted on the upper, aft inside of the door and concealed by a cover. The pump feeds air through tubing to the seal. The seal is deflated by moving the recessed mechanical switch aft. It is a mounted just forward of the door handle.

## Cabin Pressurization System

The aircraft has been structurally designed to maintain up to a 5 PSI cabin pressure differential. This equates to a cabin altitude of just 8000 ft when cruising at FL240. Lancair has ground tested the aircraft design to 10 PSI.

The cabin pressurization system is composed of the turbocharger bleed air system, cabin air distribution system, outflow control valve, the MFSC to set and monitor the cabin pressure, and an inflatable door seal.

Air for cabin pressurization is obtained from the engine turbocharger induction air system through four sonic ports. Bleed air is routed through a separate heat exchanger (inter-cooler) to reduce temperature for improved cabin comfort. Ambient air flows across the heat exchanger to cool the bleed air. A cabin dump valve is operated by pulling the control **OUT** to dump the bleed air overboard and **IN** to direct the bleed air into the cabin.

A [Dukes](http://www.dukesinc.com/cpcs.html) outflow valve is located under the rear seat and is used to actually regulate the cabin pressure differential. It can regulate the cabin pressure between 0 – 5 PSI, even in the event of power failure, and has an integral relief valve set at 6.5 PSI. It can also be operated in a non pressurized mode to allow the bleed air to provide fresh cabin air at a 0 PSI differential. This latter mode is automatically selected when the landing gear is down and the airspeed is less than 65 KIAS, or can be manually selected from the MFSC.

This outflow valve is controlled by input from the MFSC. The MFSC allows you to specify and monitor the desired cabin altitude and the desired rate of cabin altitude change. It also shows the actual cabin pressure differential.

The inflatable door seal creates an air-tight seal between the cabin door and door frame.

Warning:

The cabin is pressurized from fresh air that is pressurized by the turbos. An exhaust leak could potentially introduce carbon monoxide (CO) into the cabin. A CO detector is provided to protect the pilot from the dangerous side effects of CO contamination. If CO is detected, the cabin pressurization valve should be closed.

Caution:

The aircraft can be placed into a non pressurized flight mode by setting the cabin dump valve to dump the bleed air. This can be done at any time. It is recommended that the valve not to be set to divert air into the cabin unless the manifold pressure is less than 20 In. Hg.

## Cabin Temperature Control System

Cabin temperature control uses the fresh, potentially heated, fresh air from the cabin pressurization system. It also has two additional push/pull cables. A cabin heat valve modulates an air mixing valve to mix the pressurized air from one of two sources, the hot bleed air right after the turbochargers, or the cooler bleed air down stream from the heat exchanger. The position is **IN** for cooler air and **OUT** for warmer air. A separate push/pull control modulates the fresh, potentially heated, air between floor vents and the windshield defrosting vents.

An engine driven air conditioner and cabin fan provide additional cooling from ceiling mounted vents and is controlled from the MFSC.

Note:

The MFSC can manually cause the outflow valve to maintain a 0 PSI cabin differential. With the cabin dump valve set to **IN**. maximum fresh air flow can be obtained.

## Pitot & Static System

The aircraft is fitted with a heated pitot probe located on the lower outboard side of the right wing.

Note:

Probe heater power should never be left on except in flight. Overheating and premature loss of the heating element will occur.

The static port is located on the left side of the fuselage near the baggage door. RTS ??? Alternate static and or static drain ????

## Angle of Attack (AOA)

The aircraft is also fitted with an Angle of Attach (AOA) instrument that in conjunction with the pitot-static measurements, measures the air pressure at a constant chord position on the top and the bottom of the right wing.

|  |  |  |  |
| --- | --- | --- | --- |
| **Zero Lift** | **Max L/D** | **Best Approach** | **Imminent Stall** |
|  |  |  |  |

The imminent stall also has an audible warning coupled into the Audio Panel.

## Sorcerer Auto Pilot



The [TruTrak](http://www.trutrakflightsystems.com/home.htm) autopilot is an orthogonal rate system, with gyroscopic rate sensors that sense motion about each of the major axes (roll, pitch and yaw) that generate the fast signal responses necessary for good dynamic performance. The features include:

GPS Slaved Solid State DG VOR/LOC/ILS

Selected Angle Intercept GPS Nav Mode

GPS Steering Solid State Pitch Gyro

Select Vertical Speed Climb/Descent Altitude Hold

Digital Altimeter V-NAV

Vertical GPS Steering Altitude Select @ 50’ resolution

Select Airspeed for alt transitions Control Wheel Steering

## Emergency Locator Transmitter (ELT)

An Artex ELT G406 is located in the aft fuselage and is accessed through the access panel on the left, aft side of the fuselage. This device must be tested per the FAR’s. Remote control and status of the ELT is provided by the MFSC. The G900 provides longitude and latitude information to the emergency signal which should speed location should an emergency be signaled.

# Handling, Service, and Maintenance

## Introduction to Servicing

This section is designed to help the owner and pilot to service and maintain the aircraft in a safe and efficient manner. The intended user of this handbook is the pilot, not the aircraft's mechanic. The information is intended as a guide to maintaining the aircraft and assumes any/all work accomplished is of such quality that structural or aerodynamic integrity is not compromised. Inspections, inspection periods and servicing information should be used as a guide.

All limits, procedures, safety practices, servicing instructions and requirements contained in this handbook are considered by the owner to be mandatory.

## Repairman’s Certificate

This aircraft was built by John Olszewski and he holds the **Repairman’s Certificate** for the aircraft. It allows him to sign off on the annual condition inspection.

## Airplane Inspection Periods

The FAA requires an annual condition inspection on all experimental aircraft. This inspection must include the landing gear, all structures for cracks, evidence of delaminations, corrosion of parts, security of fittings and fasteners, a compression test of the engine's cylinders and an inspec­tion of the propeller. This Annual Condition Inspection must be signed off in the aircraft log book by the holder of the Repairman’s Certificate or an FAA certified A&P, as well as any repairs necessary due to items found during the inspection.

## Recommended Inspections

It is recommended that two additional levels of inspections beyond the preflight inspections found in the **Normal Procedures** section be made. These are at 25 hour and 100 hour intervals. In addition there are continuing care items, items which have a recom­mended overhaul or replacement schedule and special inspections required such as gear and flap extensions at high speeds.

The 25 hour inspection is intended to cover rather routine items of wear such as tires, oil changes, cable end fittings, brake linings, hose and wire fretting and rubber areas, etc.

The 100 hour inspection takes a more in-depth look at the aircraft for structural cracks, delaminations, etc., and is the same as the annual condition inspection. It is recommended that the aircraft be thoroughly washed, the engine cleaned, compression checked and a complete review of the aircraft and engine log book be made to insure compliance with all FAA (or appropriate registering agency) requirements, such as altimeter checks, item TBO's etc. This inspection must be recorded in the aircraft and engine log books and signed off by the inspector.

## Alterations or Repairs

Any modification or changes that affect the airworthiness, or that are considered a major change, must be approved by the FAA. In such cases, further testing may be required.

## Ground Handling

The three view drawings in the **General** section show the dimensions of your Lancair and its hangar requirements.

CAUTION

Proper inflation of the air/oleo style nose strut should be maintained to insure adequate propeller clearance. In addition, while ground handling your Lancair, the propeller should be placed with one blade up. Use care when turning the propeller — **ASSUME THE MAGNETOS ARE HOT**!

## Towing

The aircraft is relatively light and should present few problems while ground handling. Mechanically attached towing is generally not recommended. Hand towing is recommended as are wing walkers when towing in confined spaces.

CAUTION

If mechanical towing is necessary, a tow bar fitting in the nose wheel axle should be used and extreme care taken. Moving the nose wheel past the sideways limits will cause damage to the centering cam. Subsequent taxiing and ground operations may be difficult or unsafe.

CAUTION

Do not exert force on the propeller or control surfaces during towing by hand. If the nose wheel must be raised, apply weight on the rear fuselage forward of the horizontal stabilizer. With the nose wheel off the ground, the aircraft can be pivoted around the main gear as required.

## Tie-Downs

Built in tie-downs should be used to secure your aircraft unless it is hangered. The removable eyes screw into threaded fixtures in the wings and tail. Tie-down ropes should be left with some slack to allow for any rope shrinkage. Manila or hemp ropes should not be used. Chains can be essentially snug. Chocks for the main gear wheels are also recommended.

## Main Wheel Jacking

The aircraft can have one wheel raised by jacking. A hydraulic jack is recommended. At this point the wheel may be removed for servicing of the wheel and/or brake. Jack points are available under the fuselage.

CAUTION

Anytime an aircraft is on jacks of any sort, personnel should not be allowed in or on the aircraft.

## Nose Wheel Jacking

The nose wheel may be raised by securing some weight about the aft fuselage. An alternative is to use the tail tie-down (screw in type only) and ratchet it down with a strap attached to a suitable anchor in the floor. Another alternative is to remove the top cowl, attaching a chain and hoisting the nose using the engine lifting ring. The spinner should be closely watched to keep from raising it into the hoisting chain. Again, care must be observed and the caution note above applies.

CAUTION

In all cases, a support should be placed under the tail to prevent the tail from striking the ground.

## Out-of-Service Care

Should storage of the aircraft be required, precau­tions to protect it from deterioration are recommended. If long term storage is required, protection from the elements is the primary concern. It may be easiest to remove the wings and store it in a garage or hangar where you have (or can provide) some control over temperature and humidity. In any case, the most susceptible element of the aircraft is the engine's cylinder walls and bearing surfaces. The engine should be preserved according to the manufacturer's directions. These will essentially require it to have desiccant plugs installed and replace the oil with a preservative oil such as "MIL-L-46002, Grade 1 oil," as well as plugging the intake and exhaust ports with a desiccant. Again, refer to the TCM’s Service Bulletins for detailed instructions.

The airframe will withstand the storage quite well under almost any circumstances since it is of high temperature materials. However, the upholstery, instruments and avionics will suffer from excessive heat and exposure to the sun. A cover is recommended. Elastomers such as tires also need to be protected from exposure to ultraviolet to limit their deterioration.

Fuel tanks should be filled or drained completely, the control surfaces locked, the aircraft electrically grounded, a pitot cover installed, the static ports and AOA ports covered, the engine and cabin cooling air intake (NACA inlet) covered or plugged, and the batteries removed.

## Flyable Storage

If the aircraft is to be put into flyable storage, the engine would not be preserved nor the desiccated plugs installed. The propeller should be rotated by hand every 7 days. Rotate the engine six revolutions, stop the propeller at 45 and 90 deg. from the original position.

Each month, the aircraft should be started and run. It is prefer-able to fly the aircraft for thirty minutes as the Lancair engine compartment is tight and inadequate cooling may result from a ground run. It also dries moisture out of engine compartment.

## Preparation for Service

Following storage, the aircraft preparations for flight should include the following. Remove all taped openings, plugs and control locks. Clean and thoroughly inspect the aircraft, checking the gear, tires, controls pitot and static ports. Install serviced batteries. Install spark plugs and check the oil level. The preservative oil used for storage should be removed and proper oil installed. The fuel tanks should be checked for water accumulation and purged as required. Following a short but thorough engine ground check, the aircraft should be flown for 30 minutes maximum and given a very thorough post-flight inspection.

## Servicing

### Batteries

The batteries should be checked for cracks in the cases and the integrity of the terminals. Battery capacity can only be determined by a load check using the proper equipment. Since access for such a test is limited in this aircraft, the batteries should be removed for the test. If a weak battery is suspected and a load check is not possible, replace the battery. Experience has shown that it is cost-effective to replace one of the batteries each year by rotating the main to the aux position and placing a new battery in service as the main battery.

WARNING

Flooded electrolyte batteries are not recommended for this aircraft. There are no battery boxes to contain spillage or to capture gases for venting overboard. Hydrogen is an explosive gas in varying concentrations. The Oddisy RTS is recommended.

### Brakes

The brakes are independent systems on each of the main gear wheels. The fluid reservoir is located on the top left side of the firewall. The toe brakes should depress approximately 1/2 inch before any pressure is generated on the brake when properly ser­viced. Lines should be checked for leaks and chaffing due to rubbing on the tire or the airframe while the gear is retracted. The brake pucks should be a minimum of 0.150 inches thick. The brake pucks should be replaced when less than this value.

### Electrical Power

The alternators produce alternating current which is then converted by diodes to direct current for charging the batteries. They have no brushes or other rubbing parts. The voltage regulators are mounted behind the instrument panel. These regulators are highly reliable. DC voltage output should be the same, i.e., 28.0 to 28.8 volts. This aircraft uses a negative ground system. Excessively high voltage regulation will cause overcharging of the batteries and shorten their life. Low settings will result in a low battery and probably poor starting, especially in colder weather.

### Fuel Servicing

This aircraft requires 100LL fuel. In the event of an emergency, 100 octane may be used – if available. In any case, the fuel should be clean and water free.

The gascolator drain should be checked on preflight inspec­tions for evidence of water and the gascolator filter checked for solid foreign material. It is good practice to leave the tanks full to minimize the amount of combustible fuel/air vapor present in the tanks. This also helps minimize the amount of water vapor in the fuel system.

WARNING

The aircraft must be properly grounded for all fueling operations. Wiping the fuel filler cap with a clean, damp cloth to reduce static potential before opening the tank for fuelling is a recommended procedure for a composite aircraft.

### Nose Gear Shock Strut

Nose wheel struts contain pressurized air and oil and are a sealed system. It contains a shimmy dampening system which must be checked often. This check is made as follows:

1. Jack the nose wheel off the floor. See the “Jacking” section in this section for options on jacking the nose of the aircraft.
2. Spin the nose wheel. It should spin over one or two turns at the most. If excessive rotation occurs the axle nut must be re-tightened and the test conducted again until satisfactory. Verify that the bearings are properly snug, there must be no free play between bearings and race. Check that the side bushings are properly snugged against bearings and that they are not worn. The shimmy damper system should provide 20 to 50 ft-lbs of drag when the wheel/strut is moved (rotated left and right about the strut axis) at a moderate rate. Fast rotation rates should create higher torques.

CAUTION

Servicing instructions for the Esco Struts on Lancairs are on file at the offices of Lake Norman Aero II, LLC. If servicing the strut is not feasible, Lancair Kitplanes, Inc. will tear down, repair and service the strut for a fee. This is highly recommended if any violent shimmy is experienced during landing or takeoff operations.

### Oil Servicing

The oil used should conform to the engine manufacturer's recommendation. Since engine oil consumption is higher during break-in of a new or overhauled engine, very long flights should be avoided until it is certain that the sump quantity is sufficient for the flight duration. The oil level is checked through the small door on the top side of the engine cowling. A minimum of 9 quarts should be indicated before every flight.

### Oil Changes

During the initial break-in, the engine should be operated with a straight mineral oil such as MIL-C-6529 Type II. The break-in is normally 25 to 35 hours during which time the oil consumption should stabilize. Following this 25 hours period, the oil and filter should be changed and an oil such as MIL-L-22851 Ashless Dispersant Oil installed. If consumption has not stabilized at the 25 hour point, continue the use of mineral oil.

The engine oil should be changed at a minimum of each 50 hours of flight time. The engine oil should be drained while the engine is thoroughly warm and with the aircraft in a level position. The filter should be changed at each oil change and the element examined for its contents. If a "spin-on" filter is installed, it should be cut open and the element examined.

The preferred method of determining the nature and source of contaminants is the use of spectral analysis of an oil sample. These services are readily available by mail and can provide a running history of the contaminants from each of your oil changes.

Sand-type material is indicative of inadequate air filtration and may warrant corrective action ranging from more frequent changes to the installation of an improved filter system. Metallic particles may vary from aluminum to steel to stainless steel. Following the initial break-in period, during which some metallic particles are normal, almost any amount becomes cause for concern. If subsequent changes show additional metallic particles, the source should be determined. The type can be some-what determined by separating by category, i.e. magnetic or not, steel or aluminum, silicon (sand), etc.

### Propeller

The hub should be greased at the 25 hour point after placing it in service. Other maintenance intervals and requirements are specified in the Hartzell Owners Manual.

It is important to keep the propeller clean since it facilitates detection of cracks and other problems. The propeller must be cleaned with a non-oil based substance such as Stoddard Solvent. The solvent must only be applied to the surface of the blades with a soft brush or cloth; care must be used to avoid contact with the propeller hub and seals. Do not use any type of spray application, pressurized or unpressurized, since overspray particles could contact the propeller hub and seals. The use of water and a mild soap is also acceptable; however, never use any alkaline-based products.

The propeller is a highly stressed component and any failure has the potential of being catastrophic. Treat it with care. For aluminum blade propellers, nicks and dents (stress risers) in the leading edge due to rocks, hail or what-ever need to be "dressed out" until smooth. Care should be used to maintain a similar contour to the blade after dressing and the area should then be polished, resulting in a smooth, scratch-free surface.

When the propeller is clean, dry the surface with a soft cloth and wax the blades with a good quality automobile paste wax. The major issue with propeller care is corrosion control. Frequent cleaning and applications of paste wax will significantly retard the erosion process. These procedures are particularly applicable in geographical areas of high humidity and salt particles. Never try to remove corrosion pitting with an abrasive material such as steel wool or sandpaper since this accelerates the corrosion process.

WARNING

Use care when handling the propeller. Insure that the magnetos are OFF, the throttle CLOSED and the mix­ture in the CUT-OFF position. Then remain as clear as possible during the dressing operation. Be prepared for a cylinder to fire when moving the propeller to a new position.

### Tires

The Lancair tires should be properly inflated at all times. The nose wheel tire should contain 32-35 psig and the main gear tires from 55-65 psig. Maintaining the proper inflation will minimize tread wear and aid in ground control of the aircraft. When inflating, visually check both sides of the tire for bulges, cracking of the sidewall and cuts. The tread should be greater than 1/16."

## Care and Cleaning

Prior to washing, cover the wheels, pitot and static ports and plug cabin air intake ports. Care should be used to avoid removal of grease and oil from lubricated areas. Care should be used in the types of solvents or soaps used in the cleaning process. The paint is the PPG Delta 2000 , Base Coat-Clear Coat system (RTS). It is a rugged and flexible product, but can be chipped if one is not careful.

The windshield and the four side windows should be cleaned with generous amounts of water and a soft cloth. Prepared cleaners should be used with caution unless expressly made for acrylic material. Oil and grease can be removed with small amounts of kerosene if necessary, fol­lowed by soap and water.

WARNING

Never use gasoline, benzene, alcohol, acetone, carbon tetrachloride, anti-ice fluids, lacquer thinners or glass clean­ers. They will either soften the material or cause it to craze. Rub­bing of the surface with a dry cloth should be avoided as its causes static electricity build-up which subsequently attracts dirt and dust particles.

Upholstery materials are either leather of vinyl. The seats and the green accent stripe above the armrests are leather. The carpets can be cleaned in the normal manner. Rubber seals can be lubricated with Oakite 6, Armorall or equivalent materials. A vacuum is the primary means of cleaning the interior of loose dust and dirt. Blot up any liquid spills as soon as possible with cleansing tissues or clean rags. Hold the material securely against the spill for a few seconds, allowing it to absorb the liquid. Repeat until all liquid is removed. Scrape off any gum materi­als. Test a spot remover on a test piece of material or an out of sight location if there is any question as to the compatibility of the cleaner and the upholstery or the carpet materials. Detergent foams can be used to clean carpets if used per the manufacturer's instructions.

Interior plastic parts should be cleaned with a damp cloth. Oil and grease can be removed with cloth dampened slightly with kerosene. Volatile solvents such as those cautioned against for the windows and windshield are to be avoided here as well.

For ink stains, use a special application available through Douglas Interior Products known as a D.I.P. Stick. Since the D.I.P. Stick application must be used within 24 hours, one should be held in reserve at all times.

### Exterior Painted Surfaces

NOTE

Polyurethane should be washed only with a mild non-detergent soap. Use only soft cloths and minimize rubbing to avoid damage to the paint film surface. Rinse thoroughly with clean water. Stubborn oil or grease deposits may be re-moved with automotive tar removers if required.

Wax or polish paint only after it has completely cured. Use power polishers with extreme care as they can build up excessive heat levels locally at the polishing surface and damage the paint surface.

CAUTION

Avoid the use of high pressure cleaning systems and solvents. They can damage parts such as propeller hubs, pitot probes and static ports. Cover cooling ports to the interior and avionics.

### Engine

Clean the engine with a neutral solvent. While the engine is warm but not hot, spray with solvent and allowed to set a few minutes. Follow with a spray wash and allowed to dry. Avoid excessively high pressures which can force entry of water and/or solvents under seals resulting in contamination of the sealed system or entry through the firewall into the cabin. Use caution and protect any electrical relays or switches you may have installed in the engine compartment as well. Use only solvents which do not attack rubber or plastics.

## Recommended Servicing

### Preflight

|  |  |
| --- | --- |
| **🞎** | Check and Service Oil |
| **🞎** | Drain Water Traps |
| **🞎** | Service Fuel Tanks |

### First 25 Hours

|  |  |
| --- | --- |
| **🞎** | Change Oil and Filter |
| **🞎** | Service Oil with Ashless Dispersant Oil.  The preferred oil is Exxon Elite 20W-50 |
| **🞎** | Change Fuel Filters |
| **🞎** | Check Brake Lines |
| **🞎** | Check All Gear Doors |
| **🞎** | Check Control Surfaces and Hinges |
| **🞎** | Lube Propeller IAW Hartzell Manual |

### Each 50 Hours

|  |  |
| --- | --- |
| **🞎** | Change Oil and Filter |
| **🞎** | Clean or Change Engine Air Filter |
| **🞎** | Lubricate Landing Gear Mechanism |
| **🞎** | Check Control Surfaces and Hinges |

## Annual Condition and/or 100 Hour Inspection Report and Checklist

|  |  |
| --- | --- |
| **Owner’s Name** | F. Barry Knotts |
| **FAA Registration Number** | N4XE |
| **Inspection Type** | 🞎 100 Hour 🞎 Annual |
| **Date** |  |
| **Airframe Time** |  |
| **Engine Time** |  |
| **Propeller Time** |  |

### Power Plant (Engine) Inspection

|  |  |
| --- | --- |
| **🞎** | **Remove engine cowling and make visual inspection of the entire engine section for evidence of fuel, oil, and hydraulic leaks. Check the aluminum baffle for contact around the inlet area.** |
| **🞎** | Drain oil while the engine is warm. Poke a hole in the top of the filter to allow the oil to drain out and create less of a mess. Replace oil filter and drain plug. Refill the oil sump. |
| **🞎** | Check the internal conditions of the engine by compression while hot:  1. /80 2. /80 3 /80  4. /80 5. /80 6. /80 |
| **🞎** | Remove, clean, and regap the spark plugs. Rotate the plugs between the upper and lower positions to lengthen plug life. |
| **🞎** | Inspect spark plug terminal ends and wiring. |
| **🞎** | Check engine compartment fuel and oil lines for leaks, loose hose clamps, fittings, and general condition. |
| **🞎** | Check and clean the gascolator screen and bowl check for safety. |
| **🞎** | Check fuel filter, clean, and safety wire. |
| **🞎** | Remove and inspect air filter in cowling. |
| **🞎** | Check alternate air doors. |
| **🞎** | Inspect cylinders, fins, and baffles. |
| **🞎** | Inspect fuel induction system and tighten intake pipes and hose clamps, and look for fuel stains. |
| **🞎** | Inspect magneto points, armature shaft for looseness, and oil leakage. Magnetos need to be rebuilt or replaced after 500 hrs.  Note:  Minor changes in magneto timing can be expected during normal engine services. The time and effort required to check and adjust the magnetos will be rewarded by longer contact point and spark plug life. A smoother running engine with less maintenance will be the result. |
| **🞎** | Check fuel injection system for loose fittings, and chaffing. |
| **🞎** | Check the alternators, make sure the wires are tight and are not chaffing. |
| **🞎** | Check pressure mixing box and valve. |
| **🞎** | Wash down the engine. |
| **🞎** | Inspect and lubricate all engine controls. |
| **🞎** | Inspect Air Conditioner Compressor and hoses for defects and security. |
| **🞎** | Check the brake fluid level. |
| **🞎** | Examine the flexible vibration dampners for condition. |
| **🞎** | Check heater control mechanism and heat ducts. |
| **🞎** | Remove muffler shrouds if needed and inspect muffler and stacks for cracks, leaks, and security of installation. |
| **🞎** | Check heat ducts for condition. |
| **🞎** | Check engine mount and mount bushings for condition and security. |
| **🞎** | Check engine for loose nuts, bolts, screws, studs, etc. |
| **🞎** | Check engine cowling and baffles; repair when necessary. Install cowling and check security of installation. |
| **🞎** | Review engine ADs notes for compliance. |
| **🞎** | Check general maintenance aid notes applicable to the engine. |

### Turbochargers

|  |  |
| --- | --- |
| **🞎** | Duct tape the exhaust side of a vacuum into the exhaust pipe of the engine. Note the vacuum should be cleaned prior to test. |
| **🞎** | Check the compressor and turbo housing for leaks. Fill a spray bottle with water and then put one drop of soap in it. |
| **🞎** | Inspect impellors on the compressor for freedom of movement and condition. |

### Compressors

|  |  |
| --- | --- |
| **🞎** | Duct tape the exhaust side of a vacuum into the Compressor side of the induction system. Remove the sceet tubing from the mixer or heat valve. Plug the end of the skeet tubing. Check the compressor and induction system for leaks, also check the bleed air and inter-coolers for leaks. |

### Propeller Group

|  |  |
| --- | --- |
| **🞎** | Inspect propeller blades for nicks, bends, cracks and condition of the tips. |
| **🞎** | Remove spinner. |
| **🞎** | Inspect hub and attaching parts for defects, tightness and safety. |
| **🞎** | Check propeller hub for oil leaks. |
| **🞎** | Check propeller governor for security of mounting and oil leakage. |
| **🞎** | Check propeller control linkage for operation, security of installation & operation through full range of travel. |
| **🞎** | Check blades for looseness in hub. |
| **🞎** | Lubricate propeller hub. Refer to owner's manual. |
| **🞎** | Review Airworthiness Directive Notes on propeller for compliance. |
| **🞎** | Check spinner backing plate and brackets. Install spinner. |

### Cabin and Cockpit Group

|  |  |
| --- | --- |
| **🞎** | Check brake master cylinders for leaks, security and fill with fluid. |
| **🞎** | Check Cabin latches, handles, chains and sprockets for security and condition. Lubricate. |
| **🞎** | Inspect cabin and cockpit for loose equipment which might foul controls. |
| **🞎** | Inspect back of instrument panel for security of lines and wiring. |
| **🞎** | Check condition of attachment of all instruments and instrument panel. |
| **🞎** | Inspect for hydraulic and oil leaks. |
| **🞎** | Check all engine and cockpit controls. |
| **🞎** | Check control sticks for excessive play, security and ease of operation. |
| **🞎** | Inspect all cable attachments, cables, push pull tubes, rod ends and attachment points for controls. |
| **🞎** | Inspect all safety belts and security of attachment. |
| **🞎** | Inspect upholstery and rugs for attachment. |
| **🞎** | Check seats, rails and adjusters for breakage and distortion. |
| **🞎** | Clean windows and windshield. |
| **🞎** | Check all windows and windshield for cracks and crazing condition. |
| **🞎** | Check all flight controls for proper operation. |
| **🞎** | Check instrument markings and placards. |
| **🞎** | Clean faces of instruments. |
| **🞎** | Clean interior of airplane. |
| **🞎** | Check heating and ventilating system. |
| **🞎** | Check boost pump for fuel stains and attachment. |
| **🞎** | Inspect cabin door, locks and hinges. Remove one hinge at a time and inspect hinge pin for condition. Lubricate and install pins and hinge. |

### Wing Group

|  |  |
| --- | --- |
| **🞎** | Check surface of skin for general condition, deterioration, distortion, cracks and evidence of failure and attachment security. |
| **🞎** | Check wing attachment bolts. |
| **🞎** | Check wing tip fuel vent line. |
| **🞎** | Inspect internal structure of wings through access holes. |
| **🞎** | Check flaps and ailerons, check all push rods, clearances, rod ends, bellcranks,, brackets and actuating devices for condition and freedom of operation. Lubricate. |
| **🞎** | Check aileron and flap hinge brackets and hinge pins for looseness and condition. Lubricate. |
| **🞎** | Inspect vent holes in flaps and ailerons for blockage. |
| **🞎** | Inspect pitot mast and lines. Test Pitot heat. |
| **🞎** | Check all fairings and access panels screws. |

### Empennage Group

|  |  |
| --- | --- |
| **🞎** | Check surface condition of skin for general condition, deterioration, cracks, or other evidence of failure and security of attachment. |
| **🞎** | Remove all access panels and inspect interior areas. |
| **🞎** | Check rudder cables for chafing and condition and safety. |
| **🞎** | Check internal rudder bellcrank & pushrods. Lubricate. |
| **🞎** | Check rudder and elevator trim tabs for excessive looseness and proper operation. |
| **🞎** | Inspect rudder and elevator hinge fittings and pins for cracks, looseness and proper installation. Lubricate. |
| **🞎** | Operate rudder and elevator. Check for ease of operation and proper travel and stops. |
| **🞎** | Inspect fairings and screws. |

### Electrical System

|  |  |
| --- | --- |
| **🞎** | Inspect batteries for cracks, security of mounting and terminals for security. |
| **🞎** | Check cables for corrosion and proper insulation from battery box cover and structure. |
| **🞎** | Check electrical wiring and cables for possible chafing, security, and proper insulation. |
| **🞎** | Check electrical switches for operations and fuses for abnormalities. |
| **🞎** | Check gear position lights and limit switches for condition and proper operation. |
| **🞎** | Check strobe lights for operation and condition of flash tubes. |
| **🞎** | Check navigation lights for operation and condition of bulbs and lenses. |
| **🞎** | Check landing and/or taxi lights for operation and condition. |
| **🞎** | Inspect cabin lights for operation and condition. |
| **🞎** | Check door seal pump for condition. |
| **🞎** | Check cabin controller and outflow valve for proper operation and condition. |
| **🞎** | Perform over-voltage check on both voltage regulators. See [B&C’s LR3C-28](http://www.bandcspecialty.com/LR3B28desc.html) Troubleshooting Guide. |
| **🞎** | Check & set voltage output on voltage regulators to 28.8v. |

### Landing Gear Group

|  |  |
| --- | --- |
| **🞎** | Inspect landing gear for general condition and security of attachment. |
| **🞎** | Check condition of nose strut. |
| **🞎** | Check all linkage, trusses, and members for evidence of excessive wear, fatigue, safety, distortion, and security of attachment. |
| **🞎** | Remove wheels. Examine for cracks and other defects, check bearings, races, clean and repack. |
| **🞎** | Check tires for wear, bruises, cuts and other defects. |
| **🞎** | Check brake rotors, pads and piston assembly for condition and leaks. |
| **🞎** | Inspect hydraulic brake lines and hydraulic cylinders. |
| **🞎** | Lubricate landing gear system. Rack fittings and slide plates. |
| **🞎** | Check oleo strut for correct inflation and height, approximately 1.5 inches compression, which will leave about 3 inches of shaft showing |
| **🞎** | While the aircraft is off the ground remove the bolts from the hydraulic cylinder to drag link. |
| **🞎** | While the aircraft is off the ground remove the bolt that holds the drag link to the nose strut. Inspect bolt and drag link assembly. Check for ease of movement. Grease and lubricate all joints of the nose gear drag link. |
| **🞎** | Remove and Inspect the node gear gas strut. Test by pushing strut against a scale. It should actuate at 95 to 100 lbs. |
| **🞎** | Install the gas strut. Grease and install the nose gear to the drag link bolt. Install the hydraulic cylinder to the drag link bolt. |
| **🞎** | Check landing gear bumpers. |
| **🞎** | Inspect all hydraulic cylinders and lines. |
| **🞎** | Check nose gear for alignment. |
| **🞎** | Inspect landing gear racks and pinions. |
| **🞎** | Inspect main and nose gear bushings, torque arms, supports and pivot bearings for looseness and general condition. |
| **🞎** | Check the shimmy dampener on the nose wheel. See Systems Description for details. |
| **🞎** | Raise the aircraft, cycle the landing gear and check operation of the following:   1. Landing gear doors. 2. Gear position lights. 3. Operation of down locks. 4. Operation of the emergency blow down. |
| **🞎** | Inflate all tires to proper pressure and inspect safety of axle nuts. |
| **🞎** | Inflate all tires to proper pressure and inspect safety of axle nuts. |

### Fuel System

|  |  |
| --- | --- |
| **🞎** | Check both tanks and filler caps. |
| **🞎** | Drain sumps. |
| **🞎** | Check all fuel lines for leaks at connections and security of mounting. |
| **🞎** | Check fuel tank vents. |
| **🞎** | Check condition and operation of fuel tank selector valve. |
| **🞎** | Check placard at fuel tank filler caps. |

### Fuselage and Hull Group

|  |  |
| --- | --- |
| **🞎** | Check surface condition of skin for general condition, deterioration, distortion, cracks, or other evidence of failure and security of attachment. |
| **🞎** | Check engine mount bolts for security. |
| **🞎** | Inspect fuselage primary structure for damage. |
| **🞎** | Inspect internal condition of fuselage. |
| **🞎** | Inspect for defects, security, and the safety of all attachment fittings of various systems attached to the fuselage. |
| **🞎** | Inspect and check condition of baggage door hinges and locks |
| **🞎** | Clean off belly. |

### Radio Group

|  |  |
| --- | --- |
| **🞎** | Inspect antennas for attachment and security. |
| **🞎** | Inspect radio and electronic equipment for proper installation and security of mounting. |
| **🞎** | Check equipment and wiring for proper clearance. |
| **🞎** | Inspect wiring and conduits for security of mounting, to prevent chafing and short-circuiting. |
| **🞎** | Check bonding and shielding for proper installation and condition. |

### Emergency Locator Transmitter

|  |  |
| --- | --- |
| **🞎** | Check batteries and note the date they should be replaced. |
| **🞎** | Remove ELT from A/C. Install Portable Antenna. Test between 5 min. to the hour and 5 min. after the hour. |
| **🞎** | Lightly tap the ELT into your other hand, increasing the intensity of the impacts until it starts to transmit. Check for Reception on 121.5. Reset the ELT. |
| **🞎** | Install the ELT back into the A/C, attach the aircraft ELT antenna and push the test button. Check for reception. |
| **🞎** | Reset ELT. |

### Miscellaneous Group

|  |  |
| --- | --- |
| **🞎** | Inspect any miscellaneous items of equipment installed. Inspect for proper installation security of mounting and proper operation. |

### Items Required for Flight

|  |  |
| --- | --- |
| **🞎** | Airworthiness Certificate & Letter of Limitations |
| **🞎** | Registration. |
| **🞎** | Operating Manual. |
| **🞎** | Weight and Balance. |
| **🞎** | Fuel Grade and Capacity by filler cap. |
| **🞎** | Passenger Warning in cabin. |
| **🞎** | Experimental on door. |
| **🞎** | Identification on tail. |
| **🞎** | For IFR – VOR Test Log |

## Work Performed

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## Power Plant Operational Inspection

ENGINE MAKE: Teledyne Continental Motors

MODEL: IO-550N2B

SERIAL NO: 688044

TIME:

Start Engine normally & check oil pressure rise within 30 seconds. Check and record the following data:

Starter \_\_\_\_\_\_\_\_

Throttle to 1700 rpm

Magneto Check (Left) \_\_\_\_\_\_\_\_

(Right) \_\_\_\_\_\_\_\_

Prop Cycle once \_\_\_\_\_\_\_\_

Increase engine to full power and record:

Manifold Pressure \_\_\_\_\_\_\_\_

RPM \_\_\_\_\_\_\_\_

Fuel Flow \_\_\_\_\_\_\_\_

Oil Pressure \_\_\_\_\_\_\_\_

Oil Temperature \_\_\_\_\_\_\_\_

CHT’s \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Alternator Outputs \_\_\_\_ \_\_\_\_

Reduce Engine power to idle and record:

Manifold Pressure \_\_\_\_\_\_\_\_

RPM \_\_\_\_\_\_\_\_

Oil Pressure \_\_\_\_\_\_\_\_

Oil Temperature \_\_\_\_\_\_\_\_

CHT’s \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

Magneto Ground Check \_\_\_\_\_\_\_\_

(Turn both magnetos off then on. If engine continues to run, one or both magneto circuits is faulty.

Mixture to IDLE CUT OFF and record:

Mixture RPM Rise (25 to 50 rpm) \_\_\_\_\_\_\_\_

Positive fuel cutoff \_\_\_\_\_\_\_\_

Ignition switches, master switches & fuel selector off.

\* This inspection is required by the TCM maintenance manual for this engine (p 5-3) prior to and after 50/100 inspection.

# Performance Data