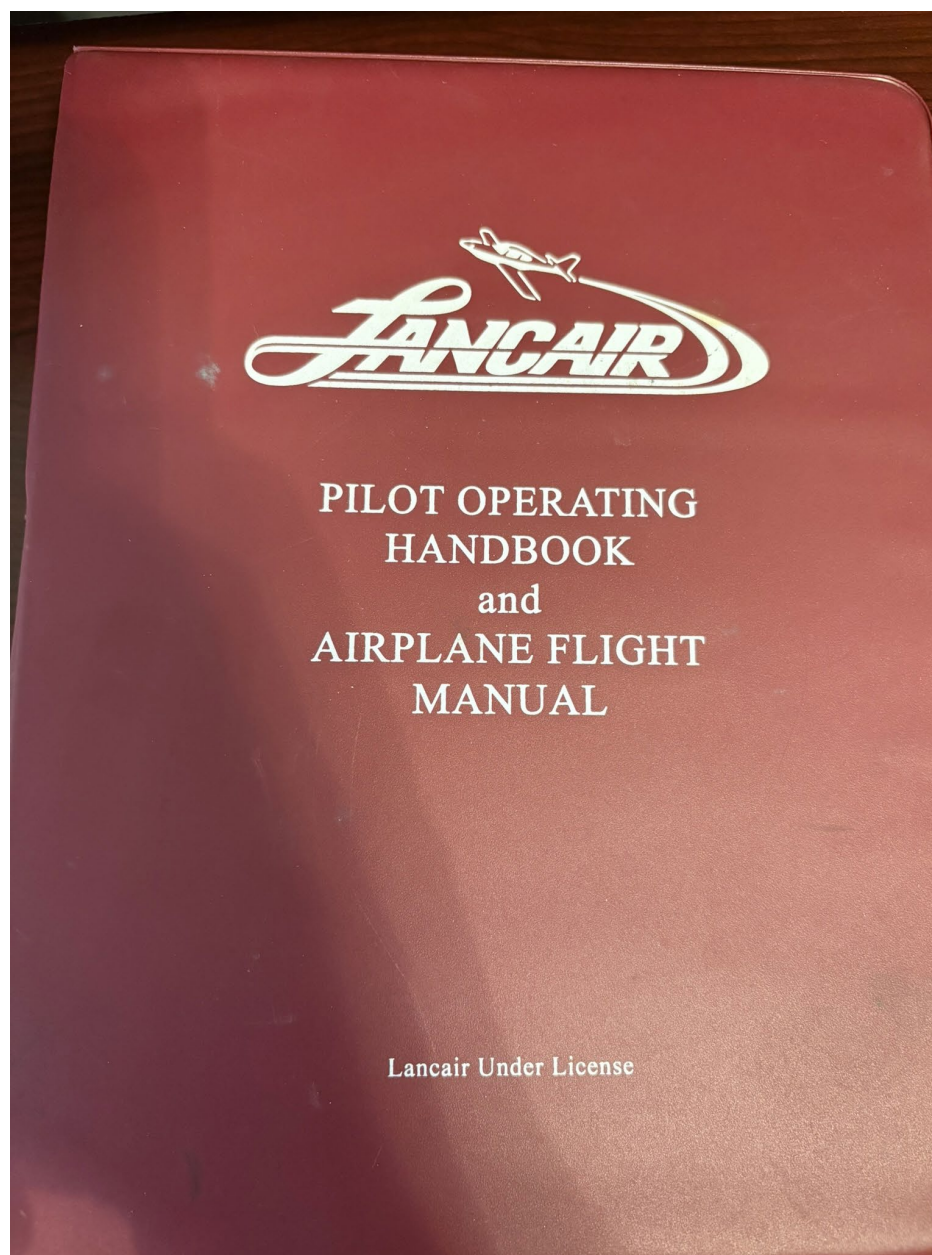


ERA25FA020

PILOT'S OPERATING HANDBOOK EXCERPTS



ELECTRICAL SYSTEM FAILURE

The electrical system of your aircraft is key to safe operation in today's environment. It is required for night or IFR operations. If a voltmeter is installed it will be your key indicator of alternator failure which then places the entire electrical load on the battery. The battery will read approximately 12.4 volts on a full battery, and 14+ on the alternator. If you experience alternator failure;

ITEM	CONDITION
Master Switch	OFF
Avionics Master	OFF
Lights	OFF
Circuit Breakers	CHECK

The check of the Circuit Breakers may reveal a popped breaker indicating the source of the trouble. If so, turn all individual equipment OFF, reset the breaker and turn the Master Switch ON. If the breaker does not activate again, slowly turn various elements of your system ON one at a time watching for another malfunction attempting to isolate the problem.

If you believe the problem has been isolated and you elect to continue the flight, remain alert for another anomaly caused by the first difficulty.

LANDING GEAR

Your Lancair gear is held up by hydraulic pressure. Pressure switches shut off the electrical power to the pump in both the up and the down positions. If the gear will not remain retracted it may be discernable by loss of cruise speed and/or additional wind noise. Proper actions are:

ITEM	CONDITION
Airspeed, reduce to below	87 kts (100 mph)
Gear Circuit Breaker	PULL
Gear Switch	DOWN
Gear Dump Valve	OPEN
Gear	3-LIGHTS
Gear Dump Value	CLOSED
Gear Circuit Breaker	RESET

It may be necessary to slip the aircraft allowing airloads to help push gear to full down. An observer (tower or aircraft) can be used to confirm its full down position.

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

WARNING

Aircraft observers must be used with caution as not all pilots have the training to safely fly "formation" and may not be sufficiently familiar with the Lancair gear to confirm its down and locked configuration.

UNLATCHED CANOPY IN FLIGHT

The Lancair has two types of canopy systems, one opening from the front, clam shell type, and the other on parallelogram hinges, opening up and forward.

Neither types of canopies can be opened in flight. Should a latch become disengaged from the locked position, slow the aircraft to approximately 85 kts (100 mph) and attempt to relock. If unable to lock, land as soon as practical.

SPINS

Spins are not recommended. If a spin is entered inadvertently or intentionally the stick should be neutralized or placed forward, the rudder full against the direction of the spin until rotation is stopped. At this point, the maneuver should be flown out of with smooth, positive load factor pull-out of no more than 4.5 g's taking particular care not to reenter an accelerated stall and another spin.

WARNING

The Lancairs are aerodynamically very clean and thus can lose a lot of altitude with such maneuvers

LANDING GEAR

The Lancair main landing gear is of the trailing arm type and is fully retractable. Operation of the gear is by a simple, self contained hydraulic system driven by an electric motor. Landing shock attenuation is accomplished by means of a compression assembly consisting of rubber disks (compression donuts) bonded to metal spacers on the main gears. When installed these disks are in slight compression. Upon absorbing shock they are further compressed and absorb the landing impact.

The retractable nose gear strut is an air/oil type with an internal shimmy dampener (for Model 320/360) and rubber compression style on the Model 235.

As an option, Model 235s can be fitted with the more effective air/oil oleo style nose strut providing superior landing and taxi operations.

WARNING

The nosewheel shimmy dampener must be checked on a regular basis. This can be accomplished by holding the nose wheel off the ground (having someone hold down on the tail) and measure the rotational resistance of the assembly. Model 235s must have at least 8 to 10 ft-lbs of torque. Air/oleo struts should have from 20 to 50 ft-lbs of torque. Also check the rotational resistance of the wheel. If more than one free revolution of the wheel occurs upon firmly spinning the tire, the AN4 axle bolt must be tightened. A small dab of witness paint should be reapplied to verify during subsequent inspections that the nut is not loosening during flight operations.

Gear Operations

In the fully extended position, the gear linkage is over-centered. In its retracted position the gear is held up by system pressure. Retracting the gear is accomplished by activating the gear up switch. This initiates the pressure buildup (to 1200 psig) by the hydraulic pump, unlocks the over-center links and raises the gear. Each gear has its own hydraulic strut with its own limit switches.

WARNING

Operation of the pump is limited to 20 seconds after which a 5 minute cooling period is required.

As the gear becomes fully retracted and pressure builds up, pump operation should be limited to 2 to 3 seconds due to the rapid heating in this "bottomed out" high pressure condition.

Extending the gear is accomplished by activating the "down" switch which initiates the low pressure side of the hydraulic pump (550 psig) and this pressure lowers the gear.

A gear dump valve in the cockpit connects the high and low pressure sides of the pump bleeding the normal "up" pressure off thus allowing the gear to extend by free falling. When this valve is activated the nose wheel will be pushed down by the pressure in the gas strut, and the main gears by their weight. A typical dump valve is shown below and is located under the instrument panel on the left side of the center console.



Note:

This valve is located under the instrument panel on the left side of the center console. Its operation should be checked periodically.

NOTE

Following use of the dump valve, some yawing of the aircraft may be required to obtain "three green" if flight speeds are excessive upon extension or if some gear adjustments are in order. If a malfunction requires the use of the manual gear extension subsequent retracting of the gear should not be accomplished prior to a thorough ground check-out.

The landing gear doors are mechanically linked to each gear and as such should not require adjustment. The linkage and microswitches should be part of every preflight inspection and be given a particularly close look following any inadvertent extension or when flight to speeds above the recommended gear operating speed of 122 kts (140 mph) has occurred. The inspection should look for loose or bent linkages and abrasion type wear.

The hydraulic reservoir should be checked periodically for fluid level and security of lines. Obviously chaffed lines, leaks, bent arms or any excessive wear anywhere in the system should be corrected promptly to preclude more serious problems.

NOTE

Early model hydraulic pumps (round metal reservoir) require the filler port to be left 1 to 1 1/2 turns loose for proper venting.

BAGGAGE COMPARTMENT

The baggage compartment is located directly behind the passenger seats. Its capacity is noted on a placard but should never exceed 50 pounds for the Lancair 235 or 60 pounds for the Lancair 320/360. The aircraft weight and balance may limit the maximum baggage to less than the maximum stated herein. A "hat shelf" may also be installed, and if so it is limited to a maximum of 5 pounds due to its significant effect on the CG.

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 its 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 towards normal.

WARNING

The Lancair does not lend itself to hand starting (propping) due to its low profile and tri-cycle gear. This practice is very dangerous.

Accessories

All engines are equipped with an alternator as a source of electrical power to charge the battery and operate various items during flight. Proper operation of the charging system is evident if the running system voltage is between 14.2 and 14.8 volts dc. Since a charged lead-acid battery has a voltage of ~ 12.1 to 12.4 volts the battery should be continuously charged while the engine is running. If no voltage measurement is available, an amp meter may show discharge (-) at low rpm conditions (indicating that current for operating the aircrafts equipment is coming from the battery) and charge (+) at higher engine rpm's indicating that the battery is being charged.

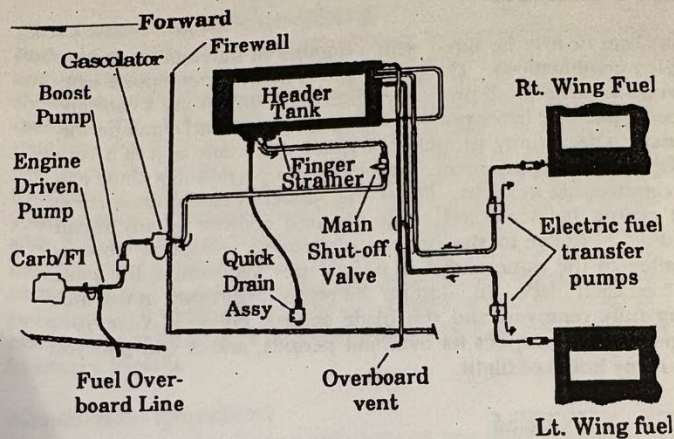
Another accessory you may have installed is a vacuum pump for operating certain flight instruments such as gyros. Its operation may be assessed by the level of vacuum it maintains. This should generally be between 4.8 and 5.2 inches of mercury. For IFR flying a small gauge is available for monitoring this vacuum and is highly recommended. Vacuum pump failures, like many others occur at just the wrong time and are often insidious as the gyro may just slowly wind down to become useless.

PROPELLERS

Your Lancair may be fitted with a number of different propeller/engine combinations. The Model 235 is generally equipped with a wooden, fixed pitch propeller while the 320/360s use a constant speed type. The latter provide improved takeoff and climb performance. Care of any 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 same 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. Give your propeller care, respect its overhaul periods, and it will pull you thru many hours of flight.

FUEL SYSTEM

The standard Lancair has a very simple fuel system. The engine is fed only from the header tank located forward of the instrument panel and aft of the firewall. It feeds fuel to the engine pump thru a fuel filter and a gascolator. The header tank is in turn fed independently from either the left or right wing tank by electrically operated fuel pumps. Each wing tank has a filter at its outlet and the fuel is pumped directly into the header tank. Aircraft with the extended tank option simply have another bay of fuel outboard of the normal tank which is integral with the normal tank. The fuel transfer pumps are independent and pilot operated. In the basic system the pilot uses the pumps left and right to maintain roll trim. Care needs to be used to preclude overfilling of the header tank as that fuel is simply forced out the vent and overboard. A light or gauge can be installed to indicate the status of the header tank. The figure on the next page shows a schematic of the fuel system.

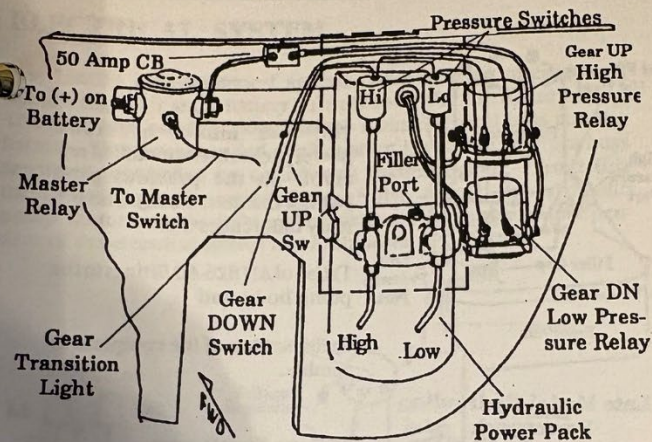


Fuel System Schematic

HYDRAULIC SYSTEM

A self contained hydraulic system is used to operate the landing gear. The pump is electrically powered. When the "gear up" position is selected the pump is activated and 1200 psi is provided to the up side of a piston operating the mechanism raising the gear (and in turn operating the gear doors). This pressure is maintained although the electric pump is disabled by an up limit pressure switch and the pressure holds the gear in its retracted position. Upon selecting the "down" position, 550 psi is provided to the down side of the cylinder and the gear is extended and driven to the overcenter (locked) position.

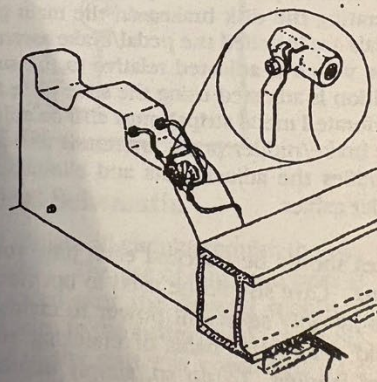
As with any hydraulic system proper servicing is required. Use only MIL-H-5606 "red" hydraulic fluid, and remember that with hydraulics, cleanliness is next to godliness. A schematic of this system is shown.



"Original"

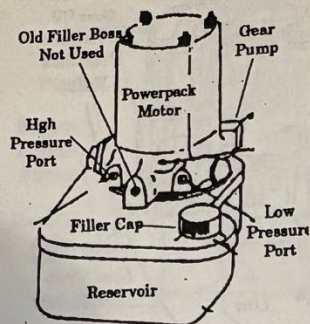
Hydraulic Power Pack Installation

A valve is provided to connect the high and low pressure lines essentially equalizing the system pressure. The main gear will then free fall of its own weight and the nose wheel gas strut will drive the nose wheel down. This "gear dump" valve is generally located just forward of the instrument panel center console area on the left side by the nose gear tunnel.



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Late Model Hydraulic Powerpack

Note:

The late model hydraulic powerpack with its modified reservoir on the previous page (within the dotted box). The primary differences are:

- 1) Use of AN 826-4D fittings in the pump body, and
- 2) Relocation of the complete assembly.

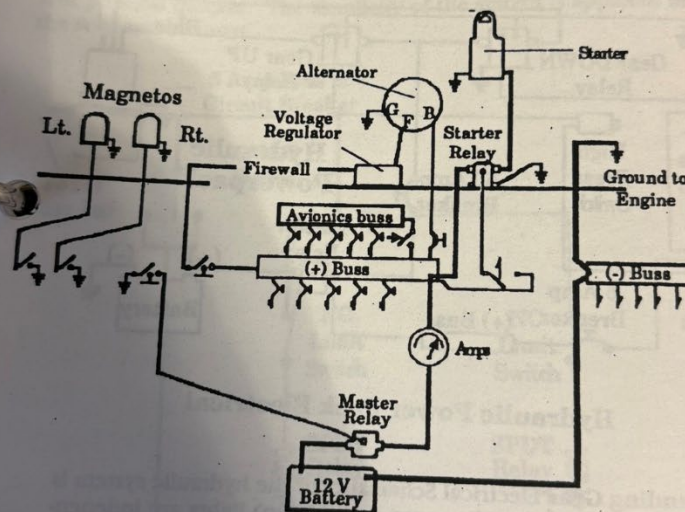
BRAKE SYSTEM

The Lancair brake system is installed on the pilots (left) side. Steering of the aircraft on the ground is by use of differential brakes. The rudder pedals incorporate independent toe brake cylinders operating the disk brakes on the main gear. If adjustable rudder pedals are installed the pedal/brake assembly is mounted on a slide plate which is adjusted relative to the sub floor. When the pedal position is adjusted using the slide plate the rudder cable adjusters (perforated metal strips) must also be adjusted. An optional "adjustable brake/rudder pedal" system is also available. This unit greatly simplifies the adjustments and eliminates the need to adjust the rudder cables.

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. Your initial flights in the Lancair like any new aircraft will require extra caution until you become familiar with the aircraft.

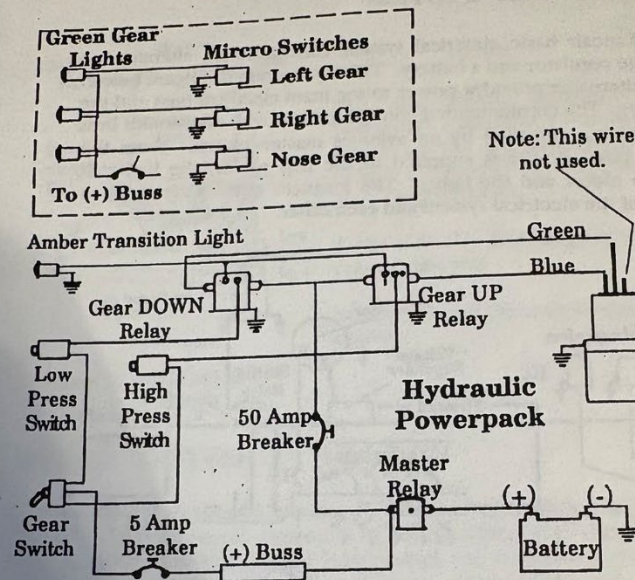
ELECTRICAL SYSTEM

The Lancair basic electrical system consists of an alternator, a voltage regulator and a battery. This is shown in the figure below. The alternator provides power to the main electrical buss and the battery. The recommended configuration is with an avionics buss separately controlled by an avionics master switch. From this main buss, power is supplied to the flap motor, the hydraulic pump motor and the lights. The magneto circuits are independent of the electrical system and each other.



Basic Electrical Schematic

Since the Lancair is a composite design, all circuits require the use of a return wire leading to "ground". The use of a ground buss is recommended with it being located near the firewall requiring only one relatively large ground wire to the battery and one "hot" wire to the starter. The power to the starter is controlled by a relay.



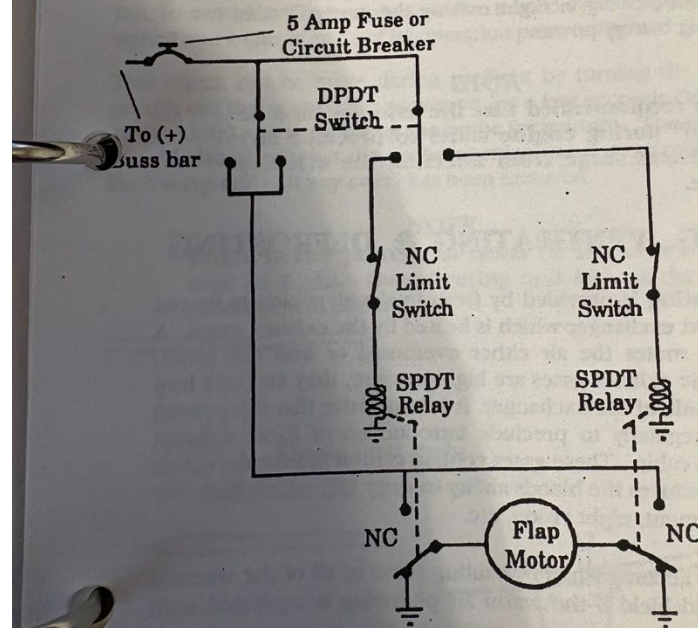
Hydraulic Power Pack Electrical

The **Landing Gear** Electrical Schematic for the hydraulic system is shown. As can be seen the green gear (down) lights are independent of this system, only shown here for completeness. The power pack is powered thru relays with pressure switches to cut power to the pump when the pressure is achieved.

The hydraulic schematic is shown under the heading of the hydraulic system in this section. Together they show the simplicity of the landing gear system.

Flap Electrical System

The wing flaps are electrically operated and off of the main electrical buss. The linear actuator (essentially a two-way electric motor driving a jack screw) is located behind the pilot's seat (on Model 320/360 and in the lower console on Model 235s). Attached to the actuator shaft is the limit switch assembly with the full up and down limit switches. These determine the extreme flap positions. Partial flaps are obtained by simply timing the actuation of the switch. For example the "count" of 5 will generally result in approach flaps. If desired a mark can be placed on the extended flap visible to the pilot to aid in reaching a consistent position quicker. The simplicity of the system is apparent in the schematic shown.



Flap Motor Wiring Schematic

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