System Descriptions

Section VII

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FLIGHT CONTROLS

NLF(1) - 0215F airfoil (a) f-0°

The Lancair 320 is conventional in its control configuration. As with some other aircraft its modern Natural Laminar Flow wing airfoil is a NLF(1)-0215F design. This allows the use of flap positions from -7° to +45° (+25° for the Lancair 235) for cruise to landing flap positions. (The 320/360 wing is reflexed, therefore faired is essentially -7°). The ailerons and elevators use push-pull tubes with bearing mounts and rod end bearings providing smooth controls. The rudder control is via stainless steel cables. The flaps are fully electric. A single flap motor drives a linear actuator and operates the flaps thru push-pull tubes also with rod end bearings.

Trim Controls

Aileron trim is provided via a fixed trim tab on the right or left aileron. During your initial flights you will determine which wing is "heavy". This heaviness is generally due to minor variations in wing incidence from left to right and is normal for almost all aircraft including the Lancair. A tab, 5/8 inches (chord) by 4 inches (span), with a maximum of 20° deflection should be the largest required. It is placed on the lower side of an aileron such that it tends to move that aileron up to provide the required trim. Adjustments to this tab to eliminate any wing heaviness during flight should be made only when equal fuel is in each wing. Subsequent to this adjustment, alternating the wing fuel quantity using the fuel pumps to transfer fuel to the header tank will maintain this trimmed condition. An electric roll trim option is available.

Rudder Trim

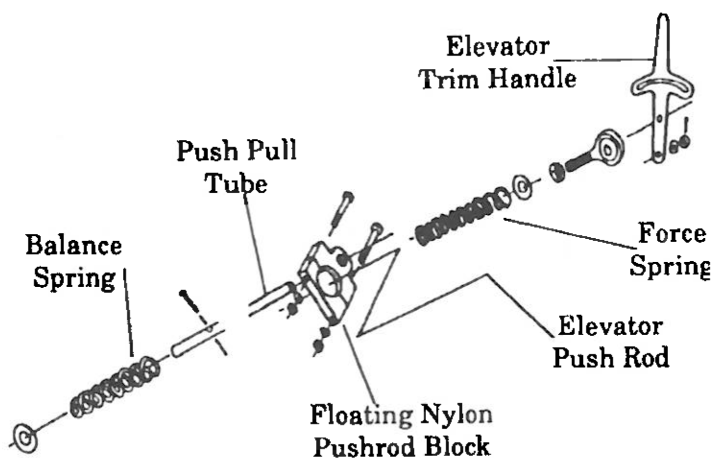
The Lancair can also be fitted with a fixed rudder trim of the same design as used on the aileron. This tab again should be adjusted such that at your normal cruise condition (power and altitude) the "ball" is centered.

NOTE

Some builders have installed manual or power rudder and/or aileron trim systems. When such a system(s) is installed an item should be added in the pre-takeoff check list to center or adjust the trims to a takeoff position.

Elevator Trim

The Lancair is fitted with a simple and effective system to trim the pitch forces out of the control system. The preferred (over a servo control) system is a manual one where a spring force is added to the elevator control push-pull tube. The exploded view shows the simplicity of the system. The "indicator" showing the trim condition is located in the center console. The lever arm is moved forward or aft to apply the spring force on the forward elevator push-pull tube. As with the aileron trim, this will require flight tests to define the proper position and markings accordingly.



Elevator Trim Control

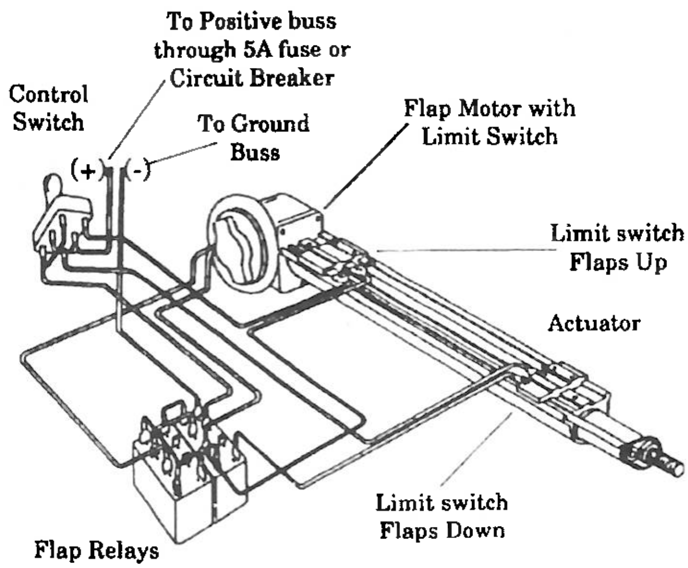
GROUND CONTROL

The Lancair is controlled on the ground using differential braking of the toe brakes located on the upper portion of the rudder pedals. A little caution for the first few times in the aircraft is all that is required to get the feel of this simple and light weight approach. Over-the-nose visibility is such that this approach is easily mastered. Initial use of the brakes during taxiing should be cautious but positive to "set" the pads and disks. Brakes should be used sparingly during the takeoff roll obviously, and rudder control can be expected to begin after about 35 kts indicated airspeed.

The standard Lancair is fitted with five inch wheels with Lamb tires on the main and nose gear. These tires are essentially scaled down "500x5" tires and generally should be operated on hard surface airports or smooth sod. A larger tire installation is under development.

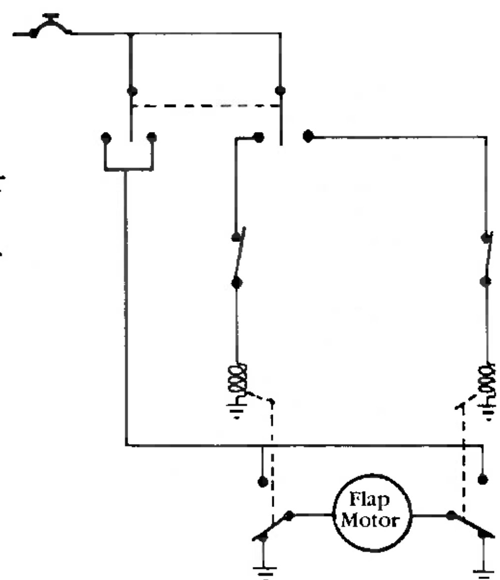
FLAPS

The flaps are electrically operated by a single electric two-way motor. The motor drives a jack screw which in turn extends and retracts the flaps. The figure below shows the flaps system in schematic form. On the Lancair 235, the flaps retract to -7° for "full up", whereas on the Lancair 320/360 this is a faired condition due to the design of the 320 airfoil. The standard technique for establishing "approach" flaps is to time the application of the down flap power. Full up and full down are determined by the setting of microswitches which deactivate the motor. Power for the flap motor comes from the primary electrical buss. A flap electrical schematic is shown on the next page.



Flap Wiring Layout

Seen again later in this section, shown here for completeness



Flap Electrical Schematic

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 checkout.

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.

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 an evasive maneuver which could change loose baggage into control jamming debris and become a hazard to the flight anywhere from a nuisance to being catastrophic.

ANTICIPATE THE LIKELIHOOD OF NEGATIVE G FLIGHT CONDITIONS FOR EVERY FLIGHT!

SEATS, BELTS & SHOULDER HARNESS

Your Lancair is fitted with seat belts and hopefully shoulder harnesses. The seat cushions are used to fit you into the plane and thus serve two purposes. First and foremost the seat cushions should be safe. Safe cushions provide proper back and seat support in case of emergencies, that is in case of an accident they should not be so soft as to not provide support under high g conditions. They should not support combustion or give off toxic fumes when subjected to fire or an ignition source. Of course in addition they should also be comfortable so that a backache is not a result of every flight. Always adjust your belt to secure you into the seat firmly for takeoff and landings. The pilot (or one pilot) should always remain belted throughout the flight.

The shoulder harness is perhaps your greatest cockpit lifesaver for takeoff and landing emergencies. Always use it if you have it installed or install it if you don't. As with a seat belt, the shoulder harness has to be snug to work to your best advantage. Always make sure any uninitiated passengers know how to secure and release their belt and harness without relying on you.

DOORS, WINDOWS AND EXITS

Your Lancair is fitted with a canopy hinged with a parallelogram mechanism. It lifts up and forward providing clear access to the cockpit from either wing. The weight of the canopy is offset by springs which make it virtually weightless. It is secured in position by four latches with over center latches each with a safety to prevent inadvertent opening. A lock can be located on one or both sides of the canopy at the mid canopy frame position. A second type, forward hinge canopy system, is also available as an option. It will typically have two similar latches toward the rear of the canopy side rails.

Normal access to the baggage compartment is provided thru the cockpit and over the seat backs.

Ingress and egress of personnel from the cockpit is via the canopy. In case of an emergency forced landing the two aft latches may be loosened on final approach to aid in quick egress after coming to a complete stop. For further information and discussions consult the emergency section of this handbook.

CONTROL LOCKS

The normal control lock for the Lancair is the use of a seat belt secured over one or both of the control sticks. And while we would all like to have a hangar for our machine, those of us who are not so lucky may have to resort to some additional protection for severe weather. This can be provided by battens for the ailerons, elevators and rudder. These battens are simply padded pairs of board such as 3" by 4" by 3/8". They can be slipped over and under control surface intersections with fixed sections and held firmly in place with a small bolt with a wing nut. Such battens will keep tail wind airloads from loading the surfaces abnormally. Wheel chocks and tiedowns go without saying. Another technique that can aid if high winds are expected involves the use of spanwise spoilers on the wings. In all cases be sure to secure such devices in a manner that precludes their coming free and causing damage that they are designed to preclude.

ENGINES

General Information

The Lancair 235 is generally fitted with a Lycoming engine of 118-135 HP, and a wooden fixed pitch propeller. With this powerplant it is one of, if not the most efficient aircraft in the air today. The 320/360 with their larger engines (160 to 180 HP) and controllable or constant speed propellers represent a logical extension of the 235 resulting in a superb cross-country aircraft.

These engines are FAA certified aircraft powerplants of 4 cylinder opposed, air cooled design provided with magnetos for ignition, a starter and generator. The simplicity of these powerplants aids in their reliability providing they are given the care such a mechanical device requires. Since this is your only source of power for flight it only makes sense to give it that extra bit of care so that it can take care of you hour after hour.

Engine Controls

There are basically two variations to these engines. They can be fitted with carburetors or fuel injection, and they can utilize fixed pitch or controllable pitch propellers. Four controls are provided for engine operation as generalized below. You should know your particular system and its operation.

All engines are equipped with dual magnetos which are shorted in the OFF position. It is mandatory that operation of the mags be checked prior to each flight. An rpm drop of approximately 100 rpm will be experienced from moderate power settings (~2000 rpm) when operating on only one magneto. The engine speed variation between left and right mags 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 be rotated on the ground without assuming that the mags are "hot" and the OFF position should be checked for operation by briefly switching the mags to the OFF position while at idle rpm prior to each shutdown. Normal shutdown then is accomplished by putting the mixture control in the cut-off position, running the engine dry of fuel.

All engines utilize a throttle to control the amount of airflow into the engine, restricting it with a butterfly (throttle) valve in the intake system. Full throttle allows unrestricted airflow into the engine resulting in manifold pressures up to ambient, resulting in maximum power output.

Controllable propeller engines also have a prop control which controls the engine rpm and maintains it at a set level. Maximum engine rpm at maximum throttle settings are desired for takeoff. Cruise power settings reduce engine rpm commensurate with manifold pressure.

Fuel/air ratio is also controlled to compensate for the large air density changes due to operation at altitude. This mixture control reduces the fuel quantity provided to the engine from "Rich" to "Lean." Leaning should be accomlished in accordance with tthe engine manufacture recommendations.

Engine Instrumentation

Oil. Oil, the life blood on 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. For specifics see the manufacturer's engine operating manual for recommendations for *your* engine.

RPM. Fixed pitch propellers have blade angles such that with full power being developed by the engine the rpm is limited to less than its allowable rpm. Controllable propellers are likewise limiting (by changing pitch of the blades) to keep the engine rpm under dangerous levels to prevent overstressing the rotating parts.

High speed descents at high power settings with a fixed pitch propeller may allow overspeeding of the engine, thus rpm needs to be monitored closely.

CHT. Cylinder head temperature is a measure of engine cooling airflow and is a measure of an adequately warm engine to accept full power for takeoff. Since the Lancair is tightly cowled, high power settings at low airspeeds (slow climb speeds 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, bird nests in the engine compartment, etc. and must be avoided.

EGT & Engine Monitors. 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 that power setting. A direct measurement of EGT is common and many devices are available in this regard. Some measure only the hottest cylinder, others measure all four. Some measure both EGT and cylinder head temperature, monitor both continuously and have alarms. Since an EGT is both a monitor of engine health, and a means of proper mixture setting it is highly recommended and will pay for itself in the long run by reduced fuel consumption and engine maintenance as well as extended life. An added benefit of these multiple sensor systems is that trouble shooting is enhanced significantly and deteriorating situations can be seen early and caught before mechanical damage occurs or dangerous in-flight situations develop. These systems are also ideal for insuring that your new aircraft is properly baffled and sealed at the start.

Carbureted engines require a system to add heat to the intake air to eliminate ice which forms in the carburetor due to the vaporization of the fuel in the carburetor which lowers temperatures in the carburetor throat. This carburetor heat valve ducts air, warmed by the engine exhaust system, into the intake system. It is a variable valve, i.e., it can be modulated to provide partial hot air, but should generally be used "full hot" initially if ice is thought to be present. With the application of this warmed air a power reduction will be noticed due to the less dense air being supplied to the engine. Upon clearing of the ice the heat should normally be returned to full cold. If a carburetor air temperature probe is installed (downstream of the throttle valve) the heat can be modulated to maintain the fuel/air mixture at slightly greater than freezing. Conditions prone to carburetor icing are high humidity air at temperatures of 20°F to 70°F. Since we seldom have humidity gauges, an indication of humidity should be obtained from the preflight weather briefing and from the clouds as seen enroute. Ice can be an insidious visitor, forming slowly, almost imperceptibly slowly or rapidly requiring an equally fast response to preclude engine stoppage - beware. Carburetor heat operation should be checked before every flight during your engine run-up just before takeoff. A noticeable rpm reduction will be experienced with the application of heat while at the mag check power setting.

Fuel injected engines spray the fuel into the intake manifold or near the intake valve and are far less prone to form ice in the intake system since there is no temperature drop due to the fuel vaporization at the throttle valve. These installations however generally have an equivalent valve termed "alternate air". This also utilizes an alternate source of air for the intake system which is somewhat warmed, but is primarily for protection from the formation of ice on the intake air inlet, screen/filter, or passageways. This valve may be spring loaded such that it opens automatically upon loss of intake air pressure or simply manually controlled. Know your system and check its operation often.

Engine Starting

Starting of the Lancair 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 priming prior to cranking the engine.

After the engine starts adjust the RPM to approximately 1000 rpm and monitor the oil pressure. If no oil pressure is indicated within 30 seconds, shut down 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 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 tricycle 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.

Fire Detection/Extinguishing

Built in fire detection is not provided nor is an extinguishing system. It is prudent to carry a fire extinguisher in your aircraft. It should be checked regularly as any extinguisher, and kept handy in case of need. Starting an over primed engine is the most likely time you may need the unit. 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 of your situation. If cranking the engine fails or cranking is not possible for some reason, introduce the contents of the extinguisher into the engine compartment via the cooling air outlets. After exhauating the extinguisher, remain clear of the aircraft. While your aircraft is made of fire resistant materials and its fumes are essentially non-toxic, it is nonetheless a flying fuel tank and must be treated as such.

Abnormal Operation

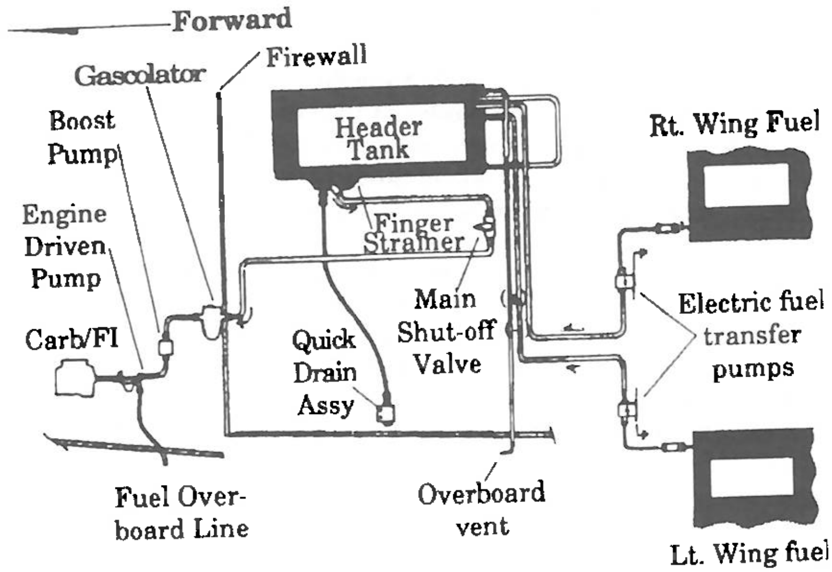
After a few hours of operating your Lancair you will become familiar with its operation from its flight controls to the engine. It is good practice to make written notes of how it is operating so that you can spot changes. These changes may be toward stabilizing or deteriorating indications and heed watching. From the engines standpoint, oil consumption for example will be high on a new engine and decrease over the first 15 to 50 hours and then stabilize. From this point it should remain stable for many hours until the rings begin to deteriorate with a corresponding 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 and EGT (individual and spreads) 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. No small reward.

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.

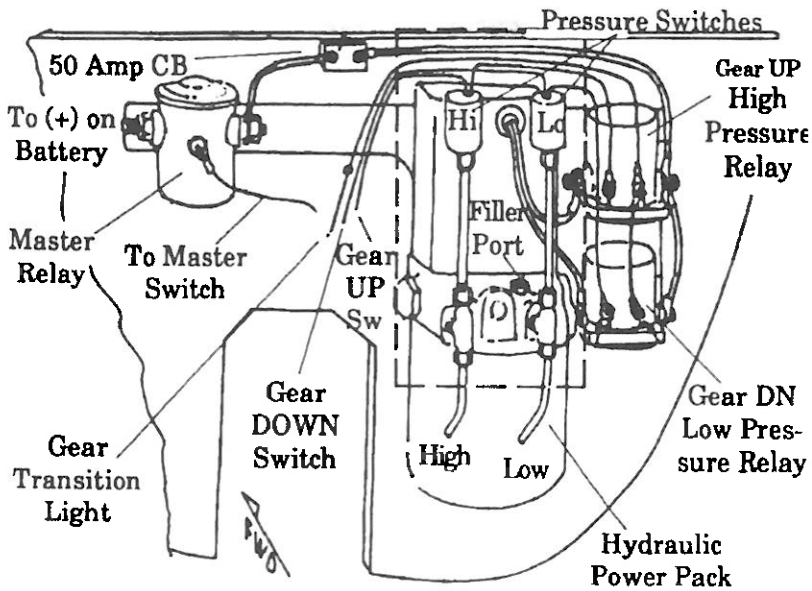


Fuel System Schematic

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.

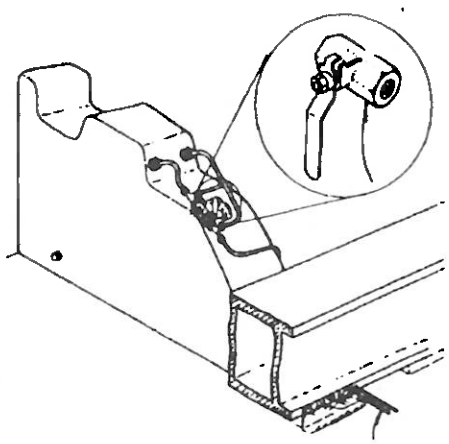
As with any hydraulic system proper servicing is required. Use only MIL-H-5606 "red" hydraulic fluid, and remember that with hydraulics, cleanliness is next to godliness. A schematic of this system is shown.

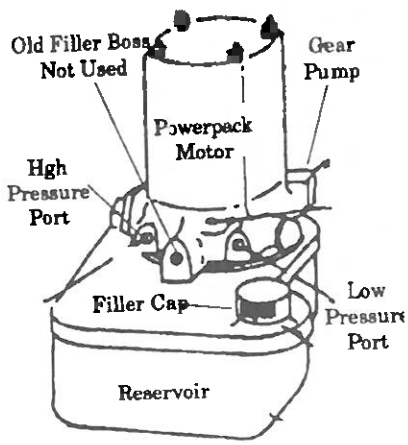


"Original"

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.





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.

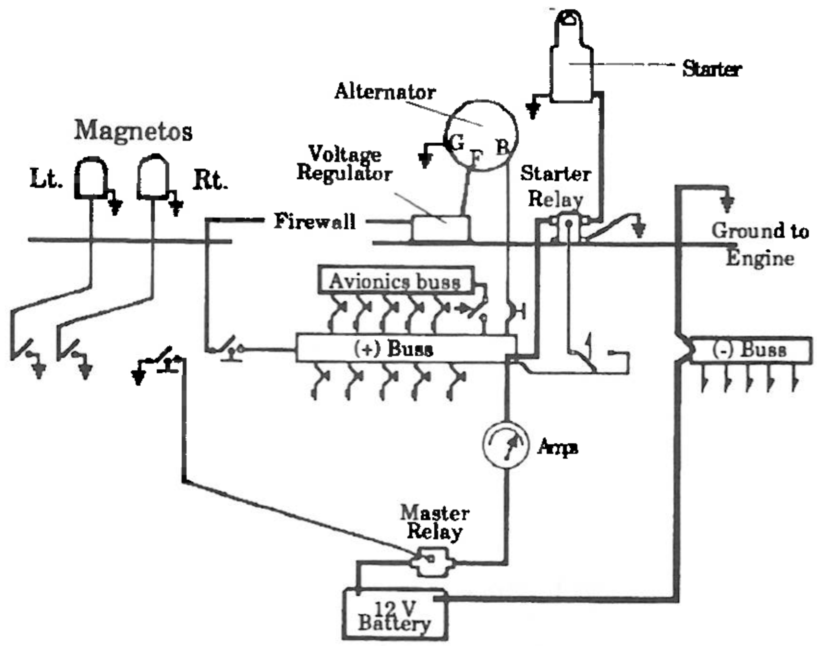
BRAKE SYSTEM

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.

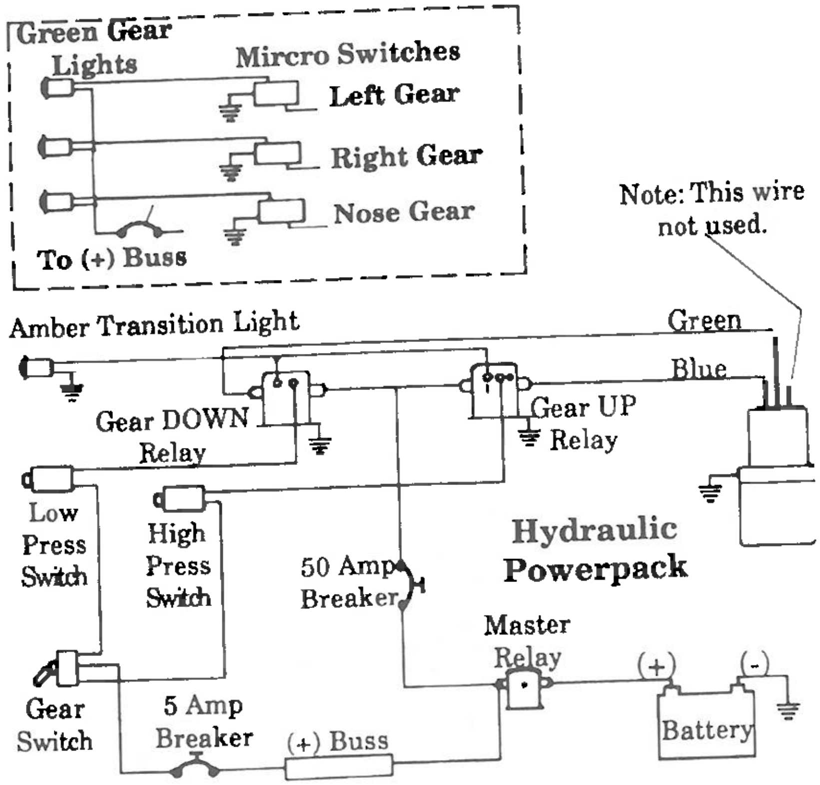
ELECTRICAL SYSTEM

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.



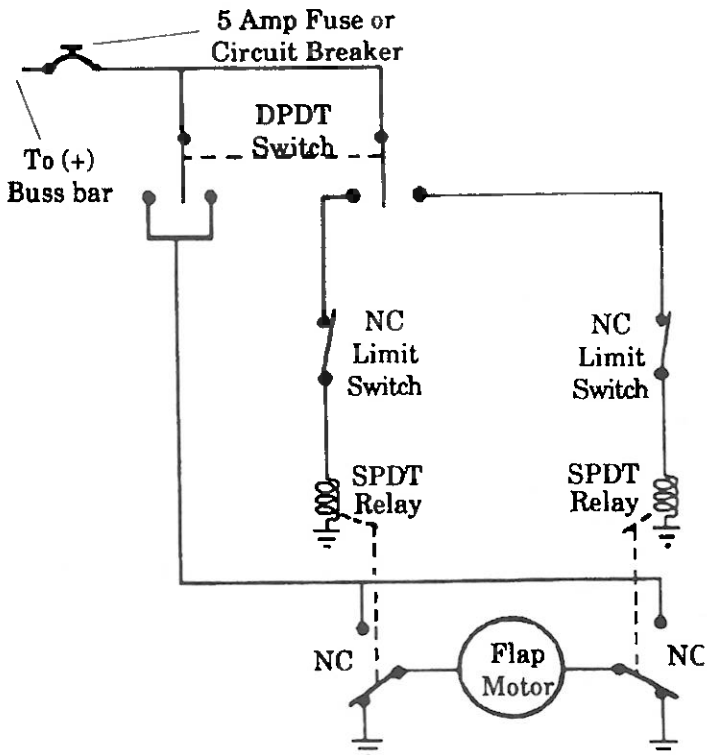
Hydraulic Power Pack Electrical

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

Aircraft Lighting

The variability of owner-built aircraft results in unique systems. Such circuits would include map lights, landing lights, instrument panel lights, position lights and strobe lights. Each would be powered off the main buss, have an approximately sized circuit breaker, have their own switch (or rheostat) and as was indicated earlier their own ground return wire required by the composite material of the Lancair.

The avionics are operated off a separately powered avionics buss to allow the whole set of equipment to be turned off and on at one time. Their lighting systems are integral and with this configuration it is possible to leave on only one comm or one nav should an electrical failure occur in flight making the most effective use of the remaining battery power.

NOTE

It is recommended that the avionics buss be "cold" during engine starts to preclude any electrical surge from affecting the avionics suite.

HEATING, VENTILATING & DEFROSTING

Cockpit heating is provided by fresh intake air which is routed through a heat exchanger which is heated by the exhaust gases. A simple valve routes the air either overboard or into the cabin. Since the toxic exhaust gases are high pressure, they can leak into the fresh air side of the exchanger. It is imperative that this system be checked regularly to preclude introduction of these exhaust gases into the cabin. These gases contain carbon monoxide which significantly reduces the bloods ability to carry O2, which seriously degrades judgment, night vision, etc.

Defrosting is accomplished by routing some or all of the warmed air to the windshield if the warm air plumbing is equipped with this arrangement.

Ventilation is obtained from two flush mounted air intake scoops which direct the outside air into the cockpit, one on each side wall. During ground operation the canopy can be left partially open until takeoff. The canopy can never be opened in flight, all latches must remain locked, the exception being on final approach for an emergency landing when rear latches only can be released. (See Emergency Procedures, Section III.)

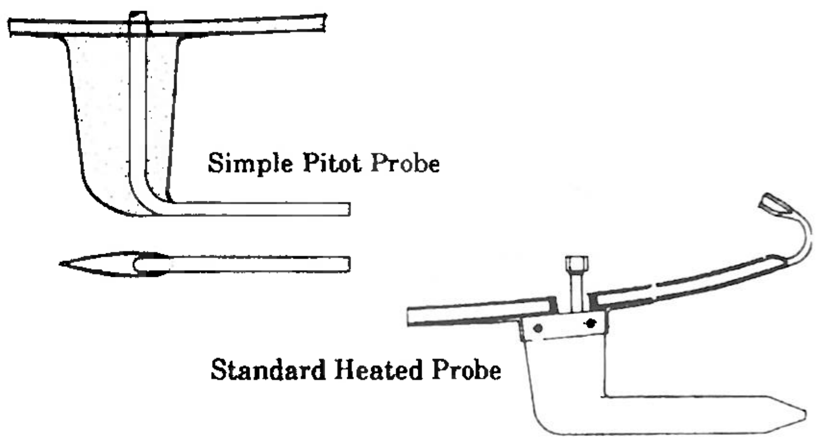
PITOT PRESSURE SYSTEM

The Lancair can be fitted with a standard heated pitot probe or an owner constructed probe (unheated). These are shown below. They are typically located on the lower side of the right wing. If your flights have the potential of below freezing temperatures, IMC conditions or precipitation the heated type should be installed and a check made of its operation prior to flight.

This check can be made during preflight by turning the master switch on, the pilot heater power on for a few seconds (less than 10 typically) and then feeling the probe for warmth. The preflight should also check that the probe opening has not become home for a wasp and that any cover has been removed.

NOTE

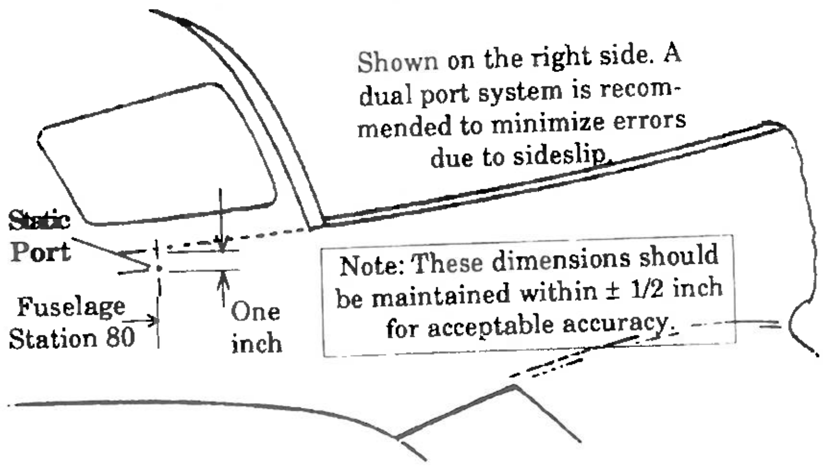
Probe heater power can never be left on except in flight. Over heating and loss of the element will occur.



STATIC PRESSURE SYSTEM

Static Port Location

The static port location is as shown in the sketch below. If the aircraft has been outdoors for some time the preflight should check for cleanliness. (It should be flush, round and square with the fuselage and be a sharp edged hole.) If a static drain exists and the plane has been exposed to rain the drain should be checked to preclude water in the system which will introduce error into the altimeter and airspeed system.

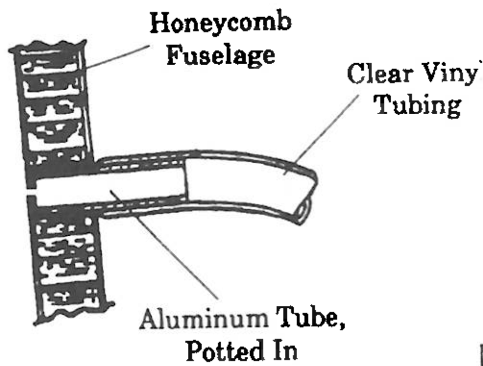


Static Port Location

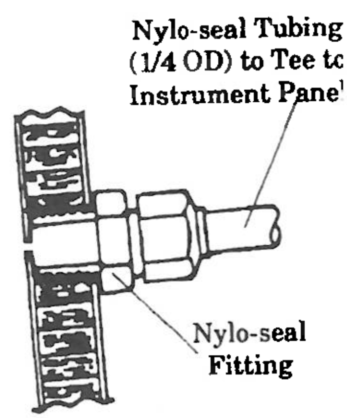
Static Port Design

Two arrangements are used for the static ports themselves and the ports can be located on one or both sides of the fuselage. The better arrangement is obviously two ports on opposite sides as the effects of yaw are reduced. The port(s) can simply be holes in the fuselage wall shown below as the "simple" design, a fitting thru the wall as shown below as the alternate design, or even a multiple hole commercially available port as found on many production aircraft (not shown).

Simple Port Design



Alternate **Port** Design



Static Port Installations

VACUUM SYSTEM

The vacuum system is powered by a vacuum pump driven by the engine. Its operation is vital to many gyro instruments and is indicated by a pressure gauge. The gauge can be one which indicates the pressure value or a small indicator with a red or green flag. Either is acceptable, however the gauge may provide an indication of gradually decreasing pump capability and thus provide some warning of failure.

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