INDEX

PREFLIGHT INSPECTION

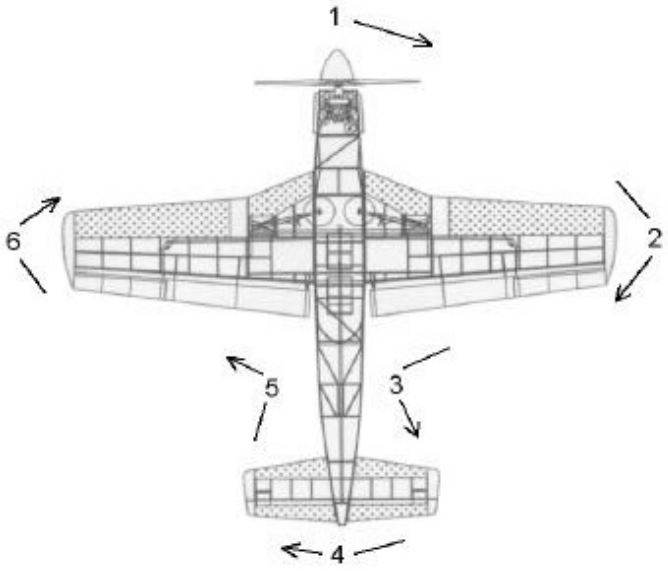

Figure 1

1) ENGINE SECTION

A. Cowl for security
B. Exhaust stacks for security
C. Propeller for nicks and blade security
D. Check oil level, coolant level

2) RIGHT WING

A. Tire for proper inflation and wear
B. Wheel and brake for wear
C. Wheel well for fluid leaks
D. Check gear assembly and down lock
E. Check strut inflation
F. Sample fuel for contamination
G. Inspect wing leading edge
H. Pitot tube cover- remove
I. Wing tip condition
J. Wing surface for general condition
K. Inspect control system linkage
L. Control surface for condition and freedom of movement
M. Trailing edge and flaps for condition

3) FUSELAGE SECTION

A. General condition
B. Static source - clean
C. Canopy checked for security
D. Coolant door for cracks, leaks, position

4) TAIL SECTION

A. Surfaces for condition and movement
B. Trim tabs for condition and position
C. Tail wheel tire, position, steering springs and proper inflation
D. Tail wheel doors for security

5) FUSELAGE, LEFT SIDE

A. General condition
B. Compartment doors secure

6) LEFT WING

A. Tire for proper inflation and wear
B. Wheel and brake for wear
C. Wheel well for fluid leaks
D. Check gear assembly and down lock
E. Check strut inflation
F. Sample fuel for contamination
G. Inspect wing leading edge
H. Wing tip condition
I. Wing surface for general condition
J. Control system linkage
K. Control surface for condition and freedom of movement
L. Trailing edge and flaps for condition

<u>ON ENTERING COCKPIT:</u>

A. Adjust seat level and rudder pedal distance
B. Adjust shoulder harness and seat belt
C. Check controls for free and proper movement

D. Landing gear selector - DOWN
E. Coolant door - OPEN; winter ops - CLOSED
F. Elevator trim - NEUTRAL
G. Propeller control - FULL INCREASE
H. Altimeter - SET TO FIELD ELEVATION
I. Fuel selector - FULLEST TANK
J. Radio master - OFF
K. All switches - OFF

START UP

A. Double check landing gear selector - DOWN
B. Master - ON
C. Fuel pump - ON (if required)
D. Propeller - CLEAR
E. Brakes - APPLY
F. Start switch - START
G. After engine start - CHECK OIL PRESSURE
H. Gear, Trim, Flap breakers - ON
I. Radio master - ON

WARM UP

A. Check engine mfg. for engine warm-up
B. Communication equipment - CHECK OPERATION
C. Flaps - CHECK PROPER OPERATION
D. Taxi when proper operational temps are reached

TAXI

A. Assure area ahead is clear by using S turns

RUN-UP

A. Trim - TAKE-OFF
B. Fuel valve - SET TO FULLEST TANK (if applicable)
C. Mixture - RICH (if applicable)
D. Check oil and coolant temps
E. Check magnetos per engine Mfg.
F. Cycle propeller (if applicable)
G. Reduce power
H. Canopy - CLOSED and LOCKED
I. Flight controls - CHECK- FREE and CORRECT

TAKE-OFF

A. Take-off area - CLEAR
B. Flaps - set - 15° to 25° down (short field 30° down), retract flaps to 10° as soon as practical
C. Oil pressure - within limits
D. Oil temp, coolant temp - within limits
E. Apply full power
F. To improve forward visibility - LIFT TAIL AS SOON AS POSSIBLE
G. Lift off speed - 50 to 65 MPH, (note - crosswind conditions)
H. Add crosswind component to lift off speed

CLIMB

A. Climb - 70 to 80 MPH
B. Establish POSITIVE RATE-OF-CLIMB
C. Landing gear - RETRACT
D. If full flaps were used - RETRACT FLAPS TO 10°
E. Flaps - retract - FULL UP
F. Check temps and pressures - WITHIN LIMITS
G. Retard throttle - CLIMB POWER
H. Retard propeller control - CLIMB RPM

CRUISE

A. Refer to engine manufacturer's recommendations
B. Fuel selector - set as desired
C. Coolant door - set as desired
D. Aux Boost pump - OFF

APPROACH TO LANDING

Before entering traffic pattern:

A. Fuel selector - FULLEST TANK (if applicable)
B. Mixture - FULL RICH (if applicable)
C. Coolant door- check temp - CLOSE (as necessary)
D. Aux Boost pump - ON

On downwind leg:

A. Landing gear - EXTEND BELOW 100 MPH
B. Flaps - BELOW 100 MPH
C. Max 10° Flaps - ABOVE 100 MPH
D. Coolant door - check temp - CLOSE (as necessary)

Base leg:

A. Reduce speed - 80 MPH
B. Flaps - AS NEEDED
C. Propeller - FULL INCREASE

Final approach:

A. Short final, reduce speed - 70 to 80 MPH (no wind condition)
B. Flaps - FULL
C. Wheel landing - 50 to 60 MPH
   Note - Crosswind and gusty conditions increase speed as necessary to establish stable approach.
D. To maintain forward visibility hold the tail in the air as long as possible - 10 to 20 MPH

GO AROUND PROCEDURE

A. FULL THROTTLE
B. Establish 80 MPH CLIMB
C. Flaps - RETRACT TO 10° - 15°
D. Landing gear - RETRACT
E. Coolant door - OPEN
F. Flaps - RETRACT - Above 80 MPH

AFTER LANDING

A. Throttle - IDLE
B. Coolant door - OPEN
C. Flaps - RETRACT
D. Propeller - FULL INCREASE
E. Aux Boost pump - OFF
F. Canopy - OPEN

EMERGENCY PROCEDURES

LANDING GEAR:

IF: LANDING GEAR WILL NOT COME DOWN

A. Double check hydraulic circuit breaker- ON
B. Make sure pump is running
    1. Indicated by amber gear-in-motion light illuminated
    2. And by hydraulic pressure, usually varying

IF: FLASHING RED OVERPRESSURE WARNING LIGHT AND THE PRESSURE GAUGE IS BOUNCING AROUND 400 PSI

A. It is likely that one of the gear limit switches is not activated
B. If this is the case, one of the green down and locked lights will not be illuminated if it is the tail wheel. Land as soon as practical and hold the tail off until the plane is stopped. If it is one of the mains, it is recommended (if possible) to request a visual verification of the gear's position from someone on the ground or another aircraft. If it appears that the gear is down, it is likely that at least the secondary lock is engaged, in which case, a gentle landing should be attempted. Make every effort not to put any side loads out the gear until sure that the over center lock is engaged.
C. Look for indication of three green down-lock lights
D. Land as soon as possible

IF: AMBER LIGHT and NO PRESSURE

A. Probable cause:
    1. Defective hydraulic pump motor
    2. No fluid in the system
B. Open dump valve
C. Skid or slip as necessary to pull gear into lock position
D. Check for green down-lock lights
E. Tail wheel may not lock
    1. Hold tail off until stopped or nearly stopped

ENGINE FAILURE:

Engine failures fall into two main categories: those occurring instantly and those giving ample warning. The instant failure is rare and usually occurs only if ignition or fuel flow completely fails. Most engine failures are gradual and afford the alert pilot ample indication that he may expect a failure. An extremely rough-running engine, loss of oil pressure, excessive coolant temperature under normal flight conditions, loss of manifold pressure, and fluctuating rpm are indications that a failure may occur. When indications point to an engine failure, the pilot should land immediately.

Engine Air Restart

If the engine fails in flight and you have sufficient altitude, you may attempt a restart, provided the engine did not fail for obvious mechanical reasons.

1. Airspeed 80 mph.
2. Ignition switch BOTH.
3. Master switch ON.
4. Fuel selector ON.
5. Fuel boost pump ON.
6. Ignition switch START if propeller is stopped.

Engine Failure During Take-off Run

The chances of engine failure during take-off can be greatly reduced if the engine is run up carefully and checked thoroughly beforehand. If engine failure occurs during take-off run before the airplane leaves the ground, proceed as follows:

7. Close the throttle completely.
8. Apply brakes as necessary to effect a quick stop.
9. If doubt exists as to whether airplane can be brought to a safe stop on runway, ignition switch OFF and fuel shutoff lever OFF.
10. Roll canopy back.
11. Shoulder harness tight.
12. After stopping, get out of airplane as soon as possible, and remain outside.

Engine Failure During Take-off (Airplane airborne).

Move mixture control to RICH if engine begins to fail. If engine fails completely immediately after take-off (Figure 2), act as follows:

1. Lower nose at once, so that airspeed does not drop below stalling speed.
2. Roll canopy back.
3. If time permits, place the wing flaps full DOWN.
4. Turn ignition switch OFF.
5. Move fuel shutoff lever to OFF.
6. Turn master switch OFF.
7. Shoulder harness tight.
8. Land straight ahead, changing direction only enough to miss obstructions.
9. After landing, get out of airplane as quickly as possible and remain outside.

Figure 2

Engine Failure During Flight

If the engine begins to fail during flight, immediately move the mixture control to RICH. If the engine fails during flight, the airplane may be abandoned, ditched, or brought in for a dead stick landing. To land with the engine dead, follow these instructions:

1. Lower nose at once so that airspeed does not drop below stalling speed. Keep IAS well above stalling speed.
2. Turn OFF fuel shutoff lever.
3. Turn OFF master switch, except when electrical power is desired for lights or avionics.
4. Choose an area for landing. If near a landing field, make a radio call. Judge your turns carefully and plan to land into the wind.
5. Roll canopy back.
6. If a runway is available or if a moderately rough surface is available, landing gear handle DOWN. If landing in rough terrain, keep the gear up.
7. Wing flaps up, save flaps to overcome possible mistakes in judgment. Lower flaps fully when proper landing is ensured.
8. Land into wind, changing direction only as necessary to miss obstructions.
9. After landing, get out as quickly as possible and remain outside.

Maximum Glide

Maximum glide distance in event of a dead engine may be attained by gliding at an airspeed of 80 mph with gear and flaps up. If conditions permit, propeller control should be placed in full DECREASE in order to reduce drag as much as possible and to minimize windmilling. (See Figure 3)

As this is an experimental airplane and all airplanes are different, the Best Glide speed will vary. Know the airplane you are flying.

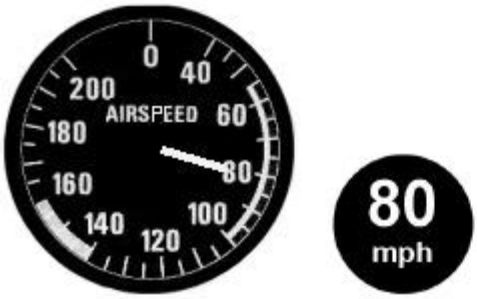

Figure 3

Note:

Best glide speed for the T-51 is going to be approximately 80 MPH, although at different loadings and aerodynamic conditions, this may change. Know your airplane, practice best glide speed with zero thrust and record it.

Best Glide Speed N #_____

PROPELLER GOVERNOR FAILURE:

Failure of the governor to operate may result in a runaway propeller. A runaway propeller goes to low pitch and may result in an engine speed that exceeds maximum rpm (red line). When such a failure occurs, the only method of reducing rpm is to pull the throttle back and decrease airspeed.

1. Pull throttle back to obtain rpm within limits.
2. Monitor engine oil pressure.
3. Maintain level flight.
4. Land as soon as practical.
5. When over a landing area, lower the gear and make approach at normal landing speed.

FIRE

Engine Fire During Start

1. Throttle closed
2. Fuel shutoff lever OFF
3. Master switch OFF
4. Leave airplane as quickly as possible
5. Extinguish fire

Engine Fire After Starting

1. Throttle closed
2. Fuel shutoff lever OFF
3. Master switch OFF
4. Leave airplane as quickly as possible
5. Extinguish fire

Engine Fire During Flight

1. Throttle closed
2. Fuel shutoff lever OFF
3. Master switch OFF
4. Land immediately
5. Exit the airplane as quickly as possible

Fuselage Fire

1. Master switch OFF
2. Activate fire extinguisher (if applicable)
3. Land immediately
4. Exit the airplane as quickly as possible

Wing Fire

1. Turn OFF all wing lighting (position, strobe, etc.)
2. Attempt to keep the fire away from the fuselage and fuel tank by side slipping the airplane.
3. Land immediately.
4. Leave the airplane as quickly as possible.

Electrical Fire

Circuit breakers protect most electrical circuits and automatically interrupt power to prevent fire when a short occurs.

Note:

> Closing a circuit breaker that has opened in flight should be attempted only in case of emergency, and then only with full knowledge of the potential hazards involved and after careful evaluation of the advantages and the disadvantages.

If the defective circuit can be identified, the circuit breaker for that circuit should be turned off. If the fire still persists, turn the master switch OFF.

Land as soon as possible.

Landing Gear Hydraulic Systems

Note A - Some of the early T-51, below serial number 50, may use the more complicated system. Refer to Figure 4.

Note B - You can identify which system is used in the aircraft by the manual valves installed. If it has both a dump valve and a bypass valve, it is the early system. If it only has the dump valve, it is the simpler system. Refer to Figure 5.

The early T-51 uses a hydraulic up-lock to lock the gear in the up position. Refer to Figure 4. This is accomplished by using an electrically operated valve in the circuit. It is designed so that whenever power is applied to the hydraulic pump motor it is also applied to the valve. (When power is applied to the valve, the valve is held open allowing fluid to flow.) When power is removed from the pump motor, and thus the valve, the valve closes. If for any reason the valve fails to open, either electrical or mechanical, the gear will be locked in whatever position it is in. The system is therefore designed with a manually operated valve that can bypass the electrically operated valve in the event that the electrically operated valve fails. This valve is the yellow manual valve located on the center pedestal and is labeled, “UP LOCK BYPASS”. If there is ever any concern that the electrically operated valve has failed, the manual bypass valve should be opened. The only negative result of this will be the gear will not be locked in the up position. Otherwise the system will operate perfectly. In fact the gear will actually up and down slightly faster. This is because you are removing the restriction of the electrically operated valve.

Early Hydraulic Systems

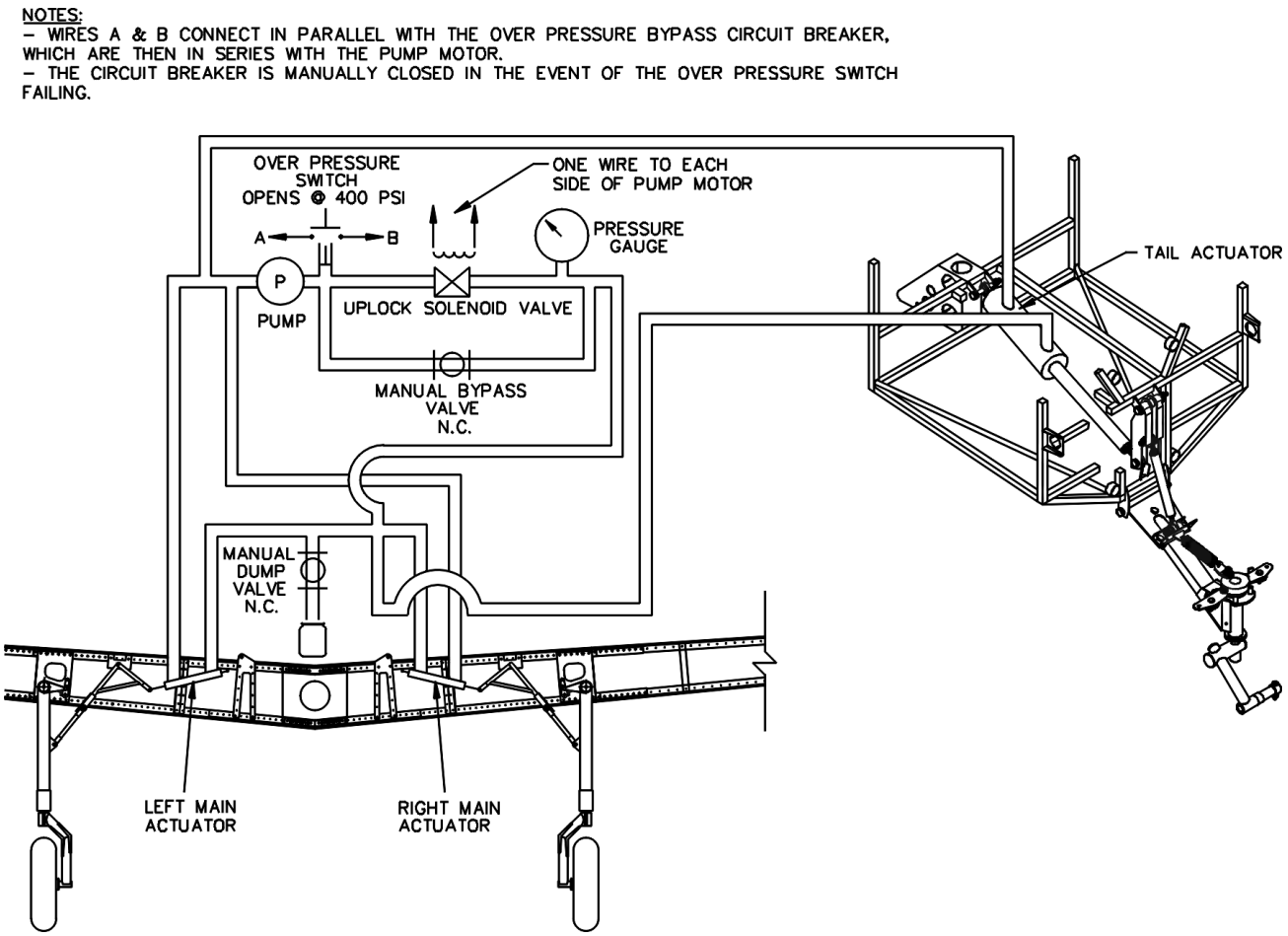

Figure 4

Another safety feature built into the landing gear system is an overpressure switch. This switch is set to open the hydraulic pump circuit if the hydraulic pressure exceeds 400 psi. The normal operating pressure is between 200 psi and 300 psi. If the pressure exceeds 400 psi, the overpressure switch is activated interrupting power thus shutting off the hydraulic pump. When the pump is shut off, the pressure will fall causing the over pressure switch to close which will turn the pump back on which will in turn increase the pressure causing the switch to open turning the hydraulic pump off. The pressure will continue to oscillate around 400 psi until the problem is corrected. If this oscillation is allowed to continue for a prolonged period of time it will result in damage to the overpressure switch or possibly the hydraulic pump motor. There are three indicators to bring the pilot's attention to this condition.

1. The hydraulic pressure gauge will be oscillating around 400 psi.

2. The amber gear unsafe light will be blinking rapidly.

3. The red overpressure light located on the center pedestal will be blinking rapidly. If this condition exists, it is recommended to put the landing gear in the down position and land as soon as practical.

Note:

It is very important to stop the oscillation as soon as possible as it could burn out the overpressure switch. If the overpressure switch fails in the open position, it will leave the hydraulic pump inoperative. If this condition exists, the red light adjacent to the overpressure bypass circuit breaker will be on steady. In the event this happens (that is the overpressure fails open):

A safety circuit is provided to bypass the overpressure switch. It is a 20 amp circuit breaker in parallel with the overpressure switch. In the event that the overpressure switch fails open, it will interrupt all power to the hydraulic pump motor. This will be indicated by the red overpressure light being on steady. In an emergency, the overpressure circuit breaker can be turned on to bypass the defective overpressure switch. This 20 amp circuit breaker will activate if the hydraulic pressure exceeds 600 psi. If this occurs, you may try a few reset cycles. If this fails, it is recommended to open the emergency dump valve, which will allow the gear to extend under gravity. This may require side slipping the aircraft in an effort to put air loads on the gear doors to help pull the gear over center. Watch for green down and lock lights on main gear. The tail wheel will likely not come down and lock. It is recommended to hold the tail in the air as long as possible. This can be accomplished through use of brakes and power. In most cases you should be able to hold the tail in the air until the aircraft comes to a complete stop, which should result in little or no damage.

Later Hydraulic Systems

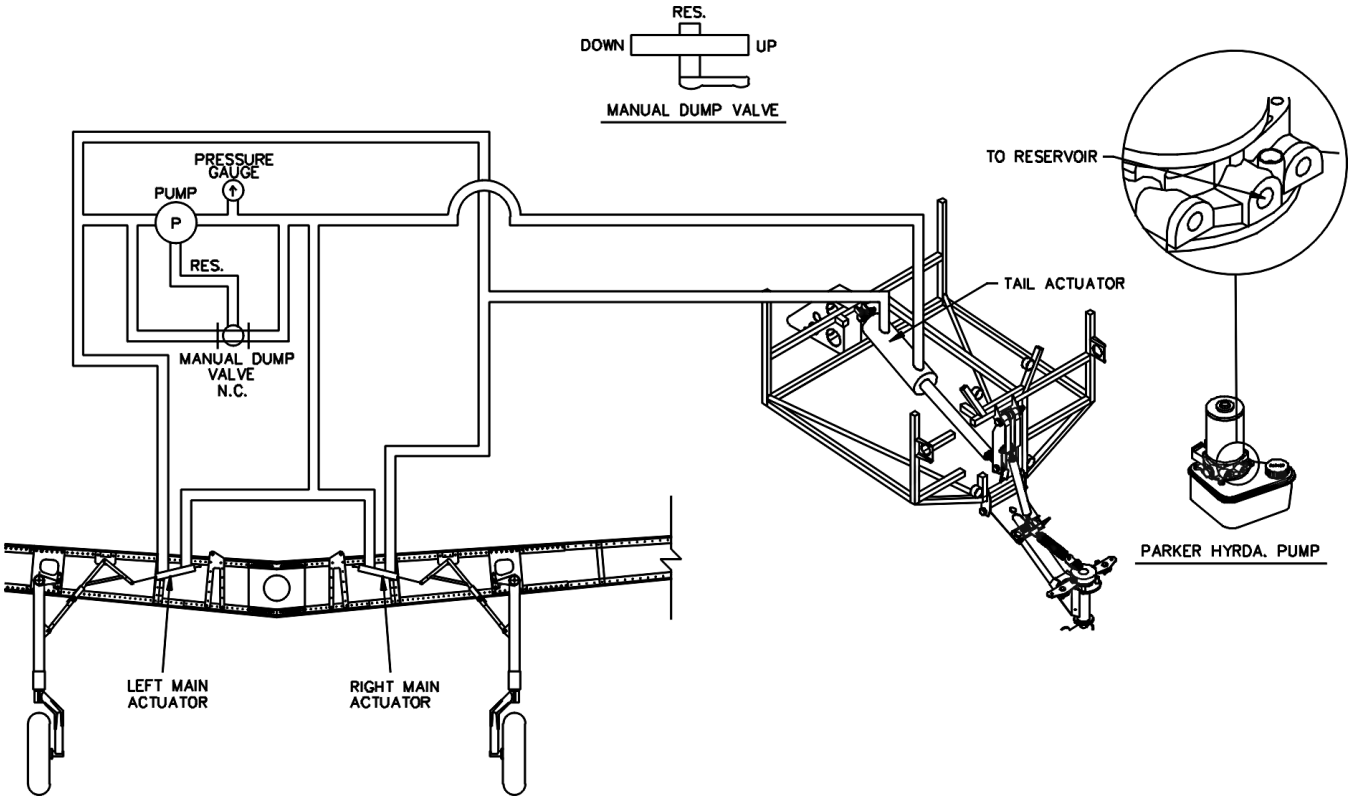

Figure 5

Figure 5 shows a simplified hydraulics system using the Parker Hannifin hydraulic pump. Which has check valves and overpressure switches built in. This is a much simpler system and simplifies the emergency gear down procedure considerably. First double check, make sure the pump is running. If the pump is running the gear "in transit" light will be illuminated. If it is not, double check the landing gear lever position, and proper lever engagement, also double check that the circuit breaker is on. If all fails, it is recommended to open the emergency dump valve. This will allow the gear to extend under gravity. If the land gear circuit breaker switch is on the green "down and lock" lights will illuminate, when the gear is down and locked. If you do not have a green light, it is likely that the gear is no down and locked. Both main gear lights should be on (indication down and locked), before attempting a landing. It's likely that the tailwheel will not come down under gravity, because the air loads usually hold the doors closed. If this is the case, it is recommended to perform a wheel landing and hold the tail in the air until the airplane comes to a complete stop. This should result in little to no damage to your plane.