AIRSPEEDS (MPH) FOR SAFE OPERATION

V_y (all weights)	105
V_x (all weights)	90
En Route Climb	120
V_{mc}	80
V_{yse}	105
V_{xse}	93
V_r	80
V_r (25° Flaps)	70
V_a (2743 lbs.)	133
V_a (4200 lbs.)	146
V_{fe} (flap extension)	125
V_{le} (gear extension)	150
V_{lr} (gear retraction)	125
V_{ref} (final approach, 40° Flaps)	90 – 95
Maximum Crosswind	15
Maximum Altitude	25,000'
Maximum CHT	435° F
Maximum Auto Pilot Speed	195

Caution: During towing, do not turn nose gear more than 20° as this will result in damage to nose gear and steering and cause possible gear failure.

LIMITING SPEEDS

10° Flaps	160 MPH
Gear Extension	150 MPH
25° Flaps	140 MPH
40° Flaps	125 MPH
Circuit Speeds	
Proximity	120 MPH
Downwind	115 MPH
Base	110 MPH

DECISION SPEEDS (V_1)

Confined Runways	90 MPH
Non-confined Runways	105 MPH

WARNINGS

Warning: The **survival equipment** on board this aircraft contains minimal content for operational training in the temperate west-coast climatic area. When flying outside this area, Langley Flying School requires that it is the pilot's responsibility to ensure survival equipment appropriate to the climatic conditions as per *CAR 602.61.*

Warning: With the exception of emergencies, Langley Flying School prohibits the landing of this aircraft at any aerodrome not certified by Transport Canada or the US FAA.

COCKPIT CHECKS

Fire Extinguisher	Check/Secure
First-aid Kit	Check
Life Jackets (if required)	Check
Flight Supplement	Check
Aircraft Journey Log	Review for Airworthiness
Pilot Operating Handbook	Check
Oxygen Masks (if required)	Check
All Electric Switches	Off
Control Locks	Removed
Seat Belts not in Use	Secured
Circuit Breakers	Checked In
Radio Master	Off
Landing Gear Control	Down
Master	On
Landing Gear Indictors	3 Green
Fuel Gauges	Check
Throttles	Closed
Mixtures	Idle Cut-off
Fuel Pumps (Individually)	On, pressure check, Off
Pitot Heat	On
Stall Indicator	Check Horn and Light
Pitot Mast	Check Heat
Pitot Heat	Off
Master	Off
Aircraft	Conduct Inspection

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PRE-START

Passenger Briefing

ELT ..... Location and Function
Door / Emergency Exit ..... Operation
Fire Extinguisher ..... Location & Operation
Seat & Seat Belts ..... Operation
Baggage ..... Stowage
First Aid Kit ..... Location
Survival Kit ..... Location
Smoking ..... No Smoking
Emergency ..... Review Procedure

(Bags - stowed, seat backs- upright, seat belts - tight, harp objects – remove from pockets, eye glasses - remove, dentures – remove, door – open prior to landing, exit – out door with least obstruction or danger).

Pre-Start

Forward Baggage Door ..... Secure/Key
Oxygen ..... On or Off
Cowl Flaps ..... Open
Fuel Selectors ..... LEFT Crossfeed—RIGHT On

ENGINE STARTS

Caution: Limit start operation to 30-second periods, separated by several minutes cooling period.

Brake Handle ..... On
Hobbs & Time ..... Record

COLD START

Both Engines
Mixtures ..... Idle Cut-off
Master ..... On
Throttles ..... Closed
Turbo-chargers ..... Off
Propellers ..... Forward
Magnetos ..... On
Alternators left/right ..... On

Each Engine (Left Engine first—***memory/no delays***)
Propeller ..... Clear
Fuel Pump ..... On
Mixture ..... Set Rich
Throttle ..... Advance 75%
Fuel Flow ..... Stabilised for 2 Seconds
Throttle ..... Closed
Mixture ..... Closed
Propeller ..... Confirm Clear
Starter ..... Engage
As Engine Starts:
Mixture ..... Advance at engine start
After Engine Starts:
Oil Pressure ..... Above red line
Throttle ..... 1000 RPM
Fuel Pump ..... Off
Fuel Pressure ..... Check
Mixtures ..... Lean 40%

WARM START

Both Engines
Mixtures ..... Idle Cut-off
Master ..... On
Throttles ..... Closed
Turbo-chargers ..... Off
Propellers ..... Forward
Magnetos ..... On
Alternators left/right ..... On

Each Engine (Left Engine—**from memory/no delays**)
Fuel Pump ..... On
Mixture ..... Set Rich
Throttle ..... Advance 75%
Fuel Flow ..... Stabilised for 2 Seconds
Throttle ..... Closed
Mixture ..... Closed
Fuel Pump ..... Off
Propeller ..... Clear
Starter ..... Engage
As Engine Starts:
Mixture ..... Advance at engine start
After Engine Starts:
Oil Pressure ..... Above red line
Throttle ..... 1000 RPM
Fuel Pressure ..... Check
Mixtures ..... Lean 40%

HOT START

Both Engines
Mixtures ..... Idle Cut-off
Master ..... On
Throttles ..... ¼" Open
Turbo-chargers ..... Off
Propellers ..... Forward
Magnetos ..... On
Alternators left/right ..... On

Each Engine (Left Engine First)
Propeller ..... Clear
Starter ..... Engage
As Engine Starts:
Mixture ..... Advance at engine start
After Engine Starts:
Oil Pressure ..... Above red line
Throttle ..... 1000 RPM
Fuel Pressure ..... Check
Mixtures ..... Lean 40%

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FLOODED START

Both Engines

Fuel Pumps..... Off
Mixtures..... Idle Cut-off
Propellers.....Forward
Master..... On
Magnetos..... On
Alternators left/right..... On

Each Engine (Left Engine first—***memory/no delay***)

Throttle.....Full Open
Propellers.....Clear
Starter..... Engage
As Engine Starts:
Throttle..... Retard Rapidly at engine start
Mixture..... Advance Slowly

After Engine Starts:

Oil Pressure ..... Check
Throttle .....1000 RPM
Fuel Pressure..... Check
Mixtures .....Lean 40%

AFTER START AND AVIONICS

Caution: Taxi using minimum power and minimum braking.

Radio Master ..... On
EFIS Master ..... On
Transponder .....Standby
Transponder Code .....Set Unassigned
ATIS.....Record
Altimeters (left and right) .....Set
Clearance Delivery (if applicable) .....Contact
Marker Beacon Lights..... Check
Com Frequencies ..... Set COM #1 and COM #2
GPS as Required:
GPS..... Complete Start-up Checks and set BARO
GPS..... Confirm Date, Time, and Place
GPS..... Check AERO Database Currency
GPS ..... Set Flight Plan
GPS..... Set NAV 4 (Moving Map)
GPS.....Set Moving Map Range
GPS..... Set/confirm Active Waypoint
GPS.....Set OBS or LEG mode
GPS..... Set ALT Alert
IFR Only
GPS.....Load DEP/ARR as required
GPS.....RAIM Approach
GPS..... Reset NAV 4 (Moving Map)

EFIS (Required):

EFIS.....Set ***Moving Map Range***

EFIS..... Select ***Airspeed/Altitude Tapes*** On/Off
Menu Select ..... On
Hot Key #1 (TPS)..... Select to edit TPS
Right Knob .....Select TPS On/Off
Menu Select ..... Off

EFIS.....Select ***ARC CDI/HSI Display*** Mode
Hot Key #3 (360)..... Toggle 360 Arc/HIS

EFIS.....Set ***Barometric Pressure***
Hot Key #5 (BARO) ..... Select
Right Knob ..... Select

EFIS..... Set ***2nd Altitude Alert***
Right Base Knob .... Press 2 times and Select

EFIS (Optional):

VHF Navigation ..... Test & Set ***NAV #1 and NAV#2***
ADF Navigation ..... Set ***ADF***

EFIS ***Navigation Sources*** (IFR/as required):
CDI Source .....Toggle to Select GPS/NAV#1
Course Selector/HDG Bug .....Set
Left BP .....Toggle to Select GPS/NAV#1/ADF
Right BP ...Toggle to Select GPS/NAV#1/ADF
ADF BP as required ..... Test

EFIS..... Set ***Airspeed Bug***
Left Knob ..... Press 2 times and Select

EFIS.....Set ***Approach Minimums***
Hot Key #2 (MIN)..... Select
Right Knob ..... Select

TAXI

Caution: Maintain power at smooth setting—1000 RPM—and use sufficient braking pressure to maintain slow speeds.

Fuel Selectors .....RIGHT Crossfeed—LEFT On
Taxi Clearance ..... Obtain if required
Wing Clearance ..... Check
Throttle.....1000 RPM
Brakes..... Release and Check
Instrument Roll Check (EFIS/SB AI/SB TC) ..... Check

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RUN-UP

Throttles ..... confirm 1000 RPM
Propeller Blast Area ..... Check Clear
Propeller Blades ..... Clear of Water or Debris
Brakes ..... Set
Trim ..... Set
Electric Trim ..... Test
Vacuum ..... Check 4.6 – 5.2"Hg
Landing and Navigation Lights ..... On
Alternators ..... Check
Landing and Navigation Lights ..... Off
Pitot Heat ..... Check load draw
Fuel Sectors ..... RIGHT & LEFT On
Mixtures ..... Full Rich
Throttles ..... 2000 RPM
Magnetos ..... Check[1]
Oil Temperatures and Pressures ..... Check
Propellers (Individually) ..... 3 Cycles of 300 RPM
Governor Check:
- Propellers ..... Reduce to 1900 RPM
- Throttles ..... Increase 2"Hg
- RPMs ..... Check 1900
- Throttles ..... Decrease 2"Hg
- Propellers ..... Set Full Forward

Mixtures ..... Check Flow
Throttles ..... Set 1500RPM
Propellers (Individually) ..... Feather Check[2]
Throttles ..... Close
Oil Pressure ..... Check
Throttles ..... 1000 RPM
Mixtures ..... Lean as required

[1] Maximum Drop 175 RPM; maximum difference 50 RPM.

[2] RPM must drop to 1000 RPM in 1 to 3 seconds—slower feathering indicates inadequate dome pressure.

PRE-TAKEOFF

Harness/Hatches/Seat ..... Check and Secure
Flight Instrument ..... Set and Checked
Magnetos ..... Both
Auto Pilot ..... All Off
Fuel Supply ..... Sufficient
Fuel Selectors ..... On
Engine Gauges ..... Check
Propellers ..... Full Forward
Turbochargers ..... Off
Flaps ..... Check and Set
Control Column ..... Free and Correct

Takeoff and Departure Procedures Briefing
- Runway ..... "___"
- Crosswind ..... "___"
- Takeoff Procedure: V_r, V_1, V_2, V_3 ..... "___"
- Departure Procedures ..... "___"

IFR and Communications Failure (IFR Only) ..... Brief

Engine Failure Procedures Briefing (from memory)

In the event of an engine failure ***below*** V_1:
- Throttle ..... Idle
- Aircraft ..... Land or Stop Straight Ahead
- Control Column ..... Full Back
- Brakes ..... Maximum

In the event of an engine failure ***above*** V_1:
- Control ..... Direction & V_{mc}
- Power ..... Maximum
- Drag ..... Retract gear & flaps
- Identify ..... Dead foot, dead engine
- Verify ..... Confirm with power
- Feather ..... Dead engine
- Fire Check ..... Check dead engine
- Emergency Destination ..... Select
- ATC ..... Declare Emergency

Time ..... Record

RUNWAY

Anti-collision Lights ..... On
Fuel Pumps ..... On
Pitot Heat (IFR Only) ..... On
Mixtures ..... Full Rich
Transponder ..... Set ALT

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TAKEOFF (FROM MEMORY)

Landing Lights ..... On
Power ..... Set 2000 RPM
Engine Gauges ..... Check
Throttles ..... Advance Maximum Power
Power Gauges..... Check for Equal (no split needles)
ASI ..... Check
VSI ..... Check

POST TAKEOFF (FROM MEMORY)

Speed ..... V_2—105 MPH
VSI ..... Positive Rate
Gear Selector ..... Up (no runway remaining)

POST TAKEOFF—400' (FROM MEMORY)

(not below 400'—clear all obstacles)

Speed ..... V_2+15—120 MPH
Power ..... Set 25"Hg
Propeller ..... Set 2500
Flaps ..... Retract

POST TAKEOFF—1000'

(from memory; not below 1000')

Landing Lights ..... Off
Fuel Pumps ..... Off Individually
Engine Gauges ..... Check

LEVEL/CRUISE

Throttles ..... Set
Propellers ..... Set
Mixture ..... Set
Cowl Flaps ..... Close
EGT ..... Check
Mixtures ..... Adjust as required
Confirm:
- Landing Lights ..... Off
- Fuel Pumps ..... Off Individually
- Engine Gauges ..... Check

PRE LANDING

Seat backs ..... Erect
Seat belts ..... Secure
Landing Light ..... On
Fuel Pumps ..... On
Fuel Selectors ..... On
Auto Pilot ..... Off
Brakes ..... Checked
Approach Briefing
- Wind Conditions ..... Anticipated/ATIS
- Runway & Procedures ..... Briefed
- V_{ref} ..... ___ MPH
- Flap Configuration ..... Flaps ___

FINAL APPROACH (FROM MEMORY)

G (Gas) ..... Fuel pumps and Selectors On
U (Undercarriage) .... Gear—3 green one in the Mirror
M (Mixtures) ..... Mixtures full Forward
P (Propellers) ..... Propellers full Forward
Final (40° Flaps) ..... ___ MPH

POST LANDING

Landing Lights ..... Off
Anti-collision Lights ..... Off
Pitot Heat ..... Off
Fuel Pumps ..... Off
Transponder ..... Standby
Mixtures ..... Set as required
Cowl Flaps ..... Open
Landing Time ..... Record

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ENGINE SHUTDOWN

Parking Brake..... On
Throttles .....Set 1000 RPM
ELT ..... Check 121.5 MHz
Avionics Times .....Record
EFIS Master ..... Off
Radio Master ..... Off
Navigation Lights ..... Off
Overhead Lights..... Off
Avionics and Instrument Lights ..... Off
Throttles ..... Close
Magnetos..... Dead Mag. Check
Mixtures ..... Idle Cut-off
Magnetos..... Off
Alternators ..... Off
Master ..... Off
Parking Brake..... Off
Aircraft..... Secured

HIGH ALTITUDE OPERATIONS

CLIMB PASSING 13,000'

Oxygen Masks..... All On
Oxygen Flow ..... Confirmed
Engine Temperatures ..... Check
Cowl Flaps.....Set as required

CLIMB PASSING FL180

Altimeter .....Set 29.92"Hg
Oxygen Flow ..... Confirmed
Passengers..... Oxygen Check
Engine Temperatures ..... Check
Cowl Flaps.....Set as required

Caution: **Maximum Continuous** Turbocharger Operation above FL200 is 25"Hg @ 2700 RPM
Caution: Reduce **V_{ne}** 5 MPH per 1000' above 19,200'.
Caution: **Minimum speed** at Maximum Turbocharged Power: 112 MPH IAS plus 1 MPH per 1000' above 10,000'.

DESCENT PASSING FL180

Altimeter .....Set Local Pressure

EMERGENCY PROCEDURES

Note: Items delineated in dotted lines indicate Phase I Emergency Actions that must be performed from memory.

ENGINE FAILURE—TAKEOFF

Below V_1:
Reject Takeoff
Land/Stop Straight Ahead
Maximum Braking

Above V_1:
Control ..... Aircraft and guard V_{mc}
Power ..... Maximum
Drag..... Flaps and Gear Retracted
Identify ..... Dead Engine
Verify..... Dead Engine
Feather.....Dead Engine
Idle Cut-off.....Dead Engine
Speed..... Blue Line
Fire-check ..... Dead Engine

IF FIRE—COMPLETE **ENGINE FIRE IN FLIGHT CHECKLIST**

.....

AT SAFE ALTITUDE—COMPLETE **SECURING FEATHERED ENGINE CHECKLIST**

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ENGINE FAILURE—CRUISE

Control—Aircraft
Power—mixtures, propellers, throttles (as required)
Drag—Flaps and Gear Retracted
Identify—Bad Engine
Verify—Bad Engine
Fire-check Bad Engine—if fire, conduct **ENGINE FIRE—FLIGHT** checklist

Cause Checks—Bad Engine:

Fuel Pump ..... ON
Fuel Selector ..... CROSS-FEED
Magnetos ..... VARIABLE SETTINGS
Throttle ..... VARIABLE SETTINGS

Problem Not Rectified—Feather Bad Engine:

Throttle ..... CLOSED
Propeller ..... FEATHER
Mixture ..... IDLE CUTOFF
Conduct **SECURING FEATHERED ENGINE** checklist

ENGINE FIRE—FLIGHT

Fuel selector ..... Off
Throttle ..... Close
Propeller ..... Feather
Mixture ..... Idle cut-off
Firewall ..... Closed[3]

Conduct **SECURING FEATHERED ENGINE** checklist

SECURING FEATHERED ENGINE

Operating Engine:

Throttle ..... Set as required
Propeller ..... Set as required
Mixture ..... Set as required
Oil Temperature ..... Check
Cowl Flaps ..... Set as required

Feathered Engine:

Magnetos ..... Off
Fuel Pump ..... Off
Alternator ..... Off
Fuel Selector ..... Off

Alternator Load ..... Check
Electrical Load ..... Reduce as required

[3] Heater/defroster off.

UN-FEATHERING PROCEDURE

Inoperative Engine:

Fuel Selector ..... On
Electric Fuel Pump ..... Off
Throttle ..... Open ¼ Inch
Propeller Control ..... Cruise Position
Mixture ..... Rich
Magnetos ..... On
Starter ..... Engage until prop windmills
Throttle ..... Reduced power until warm
If engine does not start:
Prime by turning electric fuel pump on for 3 seconds and repeat #7, 8, and 9 above.
Alternator ..... On

ENGINE FIRE—GROUND

Fuel Selectors ..... Off
Throttles ..... Close
Mixtures ..... Idle cut-off
Firewall ..... Closed[4]
Magnetos ..... Off
Passengers ..... Evacuate (left or right)
Fire Extinguisher ..... Remove
Radio ..... Communicate if safely able
Master ..... Off

[4] Heater/defroster off.

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ENGINE FIRE—START

Starter ..... Crank Engine to start if possible
Mixture ..... Idle cut-off
Throttle ..... Open
Fuel Pump ..... Off
Fuel Selectors ..... Off
Firewall ..... Closed[5]
Passengers ..... Evacuate left or right Passengers
Fire Extinguisher ..... Remove
Magnetos ..... Off
Radio ..... Communicate if safely able
Master ..... Off

ELECTRICAL FIRE IN CABIN

Master ..... Off[6]
Cabin Vents ..... Open
Land as soon as practicable

SINGLE ENGINE LANDING

Feather inoperative engine.
Do not extend landing gear until landing is likely.
Do not extend full flaps unless landing is assured.

SINGLE ENGINE GO-AROUND

Throttle ..... Open Cautiously, guarding V_{mc}
Speed ..... Blue line
Flaps and Gear ..... Retract

EMERGENCY DESCENT

Throttle ..... Close
Speed ..... 150 MPH
Gear Selector ..... Down

AUTO PILOT MALFUNCTION

Activate trim disconnect switch.
Overpower manually with control wheel or trim wheel.

[5] Heater/defroster off.

[6] If select electrical equipment is required, turn off all individual electrical items; then cautiously turn on master and required items, observing for smoke and fire.

PROPELLER OVERSPEED

Throttle ..... Close
Speed ..... Blue line
Overspeed Propeller ..... Low RPM
Throttle ..... Slowly open to engage governor
Throttle and Propeller .... Slowly increase as required[7]
Terminate flight as soon as practicable.

INDUCTION ICING

Turbocharger air source may be used as an additional head source in accordance with the following:
Each engine individually:

1. Retard throttle to 15"Hg.
2. Smoothly engage turbocharger control full ON.
3. Advance throttle carefully to desired MP.
4. Caution: monitor closely to avoid over-boost during descent; adjust throttle accordingly.
5. Smoothly disengage turbochargers exiting icing conditions or prior to landing.

GEAR EXTENSION FAILURE

Check the following before proceeding:

1. Check Circuit breakers.
2. Ensure Master is on.
3. Ensure alternators are on.
4. Ensure navigation lights are off.

To manually extend gear:

1. Reposition the clip covering the emergency disengage control—move downward to clear the knob.
2. Reduce speed—not to exceed 100 MPH.
3. Place Landing Gear Selector in "GEAR DOWN LOCKED" position.
4. Pull emergency gear extension knob.
5. Check for 3 green lights

[7] See Pilot Operating Handbook, P. 3-20.

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GEAR-UP EMERGENCY LANDING

Depending on skill level and safety consideration should be given to landing at normal speed with engines shut-down and propellers feathered.

1. Approach at normal speed.
2. Leave flaps up to reduce wing damage.
3. Close throttles and feather engines before touchdown.
4. Turn off the master and ignition switches.
5. Turn fuel selectors to OFF.
6. Contact surface at minimum airspeed.

ALTERNATOR FAILURE

1. Verify failure.
2. Reduce electrical load as much as possible.
3. Alternator circuit breaker CHECK.
4. Alternator—switch OFF for one second, then ON.
5. If no output, Alternator switch OFF, reduce electrical load, and land as soon as practical.

LOSS OF FUEL PRESSURE

Fuel Pump..... On
Fuel Selector..... Crossfeed
Land as soon as possible.

DOOR OPEN IN FLIGHT

If both upper and lower latches are open, the door will trail slightly open and airspeeds will be reduced slightly.

To close the door in flight:

- Speed..... 100 MPH
- Cabin vents..... Close
- Storm Window ..... Open
- If upper latch is open, Latch.
- If lower latch is open, open top latch, push door further open and close rapidly. Then latch top latch.

Slipping in direction of open door will assist latching

Power Setting Table - Lycoming Model IO-360-C Series, 200 HP Engine

Press. Alt Feet	Std. Alt Temp °F	110 HP – 55% Rated RPM AND MAN. PRESS. 2100	2200	2300	2400	130 HP – 65% Rated RPM AND MAN. PRESS. 2100	2200	2300	2400	150 HP – 75% Rated RPM AND MAN. PRESS. 2300	2400	Press. Alt Feet
SL	59	22.9	22.0	21.0	20.4	25.9	24.8	23.8	22.9	26.5	25.5	SL
1,000	55	22.7	21.8	20.8	20.2	25.6	24.5	23.5	22.7	26.2	25.2	1,000
2,000	52	22.4	21.5	20.6	20.0	25.4	24.3	23.3	22.5	25.9	25.0	2,000
3,000	48	22.2	21.3	20.4	19.8	25.1	24.0	23.0	22.2	25.7	24.7	3,000
4,000	45	21.9	21.1	20.2	19.5	24.8	23.8	22.8	22.0	FT	24.4	4,000
5,000	41	21.7	20.8	20.0	19.3	FT	23.6	22.6	21.7	-	FT	5,000
6,000	38	21.4	20.6	19.8	19.1	-	FT	22.3	21.5			6,000
7,000	34	21.2	20.4	19.6	18.9	-	-	22.1	21.3			7,000
8,000	31	21.0	20.1	19.4	18.7	-	-	FT	21.0			8,000
9,000	27	FT	19.9	19.2	18.5	-	-	-	FT			9,000
10,000	23	-	19.7	19.0	18.3							10,000
11,000	19	-	FT	18.7	18.1							11,000
12,000	16	-	-	FT	17.8							12,000
13,000	12	-	-	-	17.6							13,000
14,000	9	-	-	-	FT							14,000

To maintain constant power, correct manifold pressure approximately 0.16" Hg for each 10°F variation in inlet air temperature from standard altitude temperature. Add manifold pressure for air temperatures above standard; subtract for temperatures below standard.

OPERATIONAL REQUIREMENTS

- Add oil at the 6 US quarts level.
- Keep cabin doors secured at all times.
- Langley Flying School's *Aircraft Status Board* must be reviewed prior to flight
- Relay all emergencies through Flight Service (1-800-INFO-FSS). Also contact Langley Flying School at (604) 532-6461 or, after hours, (604)599-9966 or (604) 581-0358.
- As per Transport Canada requirements, maintenance on this aircraft (other than the adding of fuel, oil, or air) is prohibited without the consent of the *Maintenance Manager* for Langley Flying School.
- The pilot is responsible to ensure that the aircraft is properly equipped with survival equipment as per the *Canadian Aviation Regulations*.

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