

**OPERATING INSTRUCTIONS****NOTE**

Refer to Airplane Flight Manual for CAA Approved Operating Limitations, performance figures, and detail loading instructions.

**PREPARATION**

1. In preparing for flight, it is important that the operation of every component of the airplane be checked. Malfunctioning of the primary controls and equipment must be discovered and remedied before flight, and it is well to know what units of secondary equipment (radio, lights, brakes, etc.) can be relied upon even though their use may not be anticipated in the flight to be made. The following list is provided as a guide in checking the operation of the airplane and its components.
2. Ascertain that there are no repairs in progress on the airplane that will render it unsafe for flying.
3. Remove pitot tube cover and any other installed weather covers.
4. Reinstall external antenna if disconnected.
5. Inspect the main wheel tires for correct air pressure. Correct tire pressure is airplane gross weight, in pounds, divided by 100.
6. Bleed each fuel tank sump (see Figure 6) to remove any water that may have accumulated.
7. Check air duct openings in engine cowl nose and bottom cowl for litter and obstructions. Carburetor air filter should be removed to prevent plugging by snow during the winter months.
8. Measure oil level with the dip stick. The dip stick is just aft of the rear cylinder on the right side. Unscrew the dip stick to remove it. The crankcase oil capacity is nine quarts.

9. Bleed fuel strainer on firewall to remove any water that may have accumulated.
10. Check spark plug insulators for cleanliness so that dirt and moisture will not decrease intensity of the spark.
11. Check flight controls (ailerons, elevator, flaps, and rudder) for freedom of operation.

### NOTE

The control system is designed so that the elevator up travel is restricted when the flaps are raised.

12. Turn elevator trim tab crank to full travel each way and then return to neutral.
13. Turn rudder trim tab knob to full travel each way and then return to neutral.
14. Test operate brake pedal operation. If pedal action is soft and unresponsive, there is air in the hydraulic lines which should be removed before take-off.
15. Turn master switch on.
16. Check quantity of fuel in each tank. Turn fuel gauge selector switch to *R* for right tank and *L* for left tank reading.
17. Turn fuel selector valve on to the tank that has the greater quantity of fuel.
18. Set altimeter to the *pressure-altitude* of field.
19. Check operating condition of the radio receiver and transmitter. Pin-point light beneath radio dial should glow when button on microphone is pressed.

### CAUTION

Transmitter check should be made only when control tower frequency is clear. Be brief, transmit only messages essential to safety of life and property in the air. (See Sections 9.62 and 9.91 of Federal Communications Commission's Rules and Regulations)

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20. Test operate all lights. If instrument panel lights are not bright, turn the rheostat located under the switch panel. Make an independent and quick inspection of the landing lights.

### CAUTION

Radiation heat of landing light may cause lamp failure if operated for more than a few seconds when the airplane is not in flight.

21. Be certain that the weight limits, specified in the Airplane Flight Manual, are not exceeded by the load of passengers and/or baggage to be carried. When rear seats are removed and cargo is loaded, be certain that cargo is securely lashed in place. Use of the rear safety belts or special sling is recommended.

## ENGINE STARTING

### NOTE

The radio should be turned off when starting engine. The voltage drop resulting from operation of the starter may cause excessive arcing across vibrator contacts and result in damage to the vibrator.

22. Prime carburetor with three strokes of the throttle. Set throttle control in approximately  $\frac{1}{4}$  inch.

23. Push mixture control all the way in to *full rich*.

24. Unlock primer control and prime with no more than three strokes, depending on temperature of engine. A warm engine does not need priming. During cold weather starting, occasional operation of the primer may be necessary for thirty seconds after initial starting.

### CAUTION

Be certain that primer control is locked in after priming. If this is not done, primer may leak causing over-rich mixture and excessive use of fuel during flight.

25. Push the button just above the ignition switch handle to allow the switch to turn to *start*. The switch is spring loaded and must be



held on the start position. When the engine fires, release the switch and allow it to return to *both*. Starter is not operative until master switch is *on*.

### CAUTION

If no oil pressure is indicated within 30 seconds after engine starts, stop engine. The oil system should be investigated and the trouble remedied before operating the engine.

26. If the engine does not start, and if fuel drips from the drain or from the exhaust pipes, the engine is flooded or over-primed; consequently, turn ignition switch off, pull mixture control out to *idle cut-off*, open throttle to *full open*, and rotate the propeller several revolutions by hand, backwards to the normal rotation. Then try starting again.

27. Refer to General Service Manual for additional causes and remedies for refusal of the engine to start.

### WARM-UP

28. When the engine starts, set the throttle to hold the speed between 900 and 1000 rpm. After oil pressure is at least 20 psi, warm up at 1000 rpm until oil temperature begins to rise. During cold weather starting, below 25 degrees Fahrenheit, do not exceed 1500 rpm for five minutes to allow oil to warm-up.

### GROUND TEST

29. Turn the fuel selector valve to the left tank and to the right tank long enough to insure proper engine performance from either tank. One minute on each tank will be sufficient.

30. Open the throttle until 2000 rpm is attained. The engine instruments should read as follows:

Oil Pressure	40 to 45 psi
Oil Temperature	60°
Tachometer	2000 rpm
Ammeter	Charge

Do not operate the engine above 1600 rpm on the ground longer than necessary to test the instruments, nor operate the engine below 1000 rpm for long idling periods as it will cause fouling of the plugs.

### CAUTION

The pressure baffle cooling system used on the airplane requires forward speed to cool the engine. Under no circumstances operate the engine at or near full throttle longer than is necessary for a quick reading of the instruments.

31. At 2000 rpm, test the magnetos by switching from *Both* to *R Mag* for a moment. If any of the cylinders miss fire, it indicates one or more faulty spark plugs in the upper level of the left bank of cylinders or in the lower level of the right bank. Return the ignition switch to *Both*. Turn the ignition switch from *Both* to *L Mag* for a moment. A drop in tachometer reading when operating on one magneto should not be more than 200 rpm from that of operation on *Both*. Make the test as quickly as possible to prevent damage from detonation. During cold weather, below 30 degrees Fahrenheit, use of carburetor heat may correct stumbling of engine when operating on single magneto ignition. If any of the cylinders miss fire, it indicates one or more faulty spark plugs in the lower level of the left bank of cylinders or in the upper level of the right bank. Return the ignition switch to *Both*.

32. With the engine running at 800 rpm, turn the ignition switch off momentarily. If the engine does not stop firing, a defective magneto ground connection is indicated. Stop the engine by pulling the mixture control full out to the *idle cut-off* position and slowly opening the throttle. Keep clear of the propeller until the source of the trouble is located and remedied.

### TAXIING

33. Be certain that the main wheels are not stuck or mired before attempting to taxi.

### CAUTION

Never attempt to free airplane by lifting or pushing up on the lift struts.

34. Release the parking brake, applying pressure to the brake pedals, and then pushing the control knob *in*.

35. The rudder pedals operate the tail wheel to steer the airplane on the ground. The brakes can be used for turning the airplane when taxiing, but to avoid excessive brake wear, the steerable tail wheel should be used as the principal means of steering when on the ground.

## **TAKE-OFF**

36. Use *full rich* mixture for take-off.

37. Flaps need not be used for take-off. Placing flap control in first notch, however, will reduce the distance necessary to get off the ground, although airspeed and rate of climb will not be as great as with the flaps up.

38. Set elevator and rudder trim tabs for take-off.

39. Refer to Airplane Flight Manual for take-off distances.

40. When take-off is accomplished with flaps down, raise flaps gradually after sufficient altitude has been attained to clear all ground hazards.

## **CLIMB**

41. Use *full rich* mixture for climb.

42. The best rate of climb with flaps up is obtained at an airspeed of 82 mph when loaded to 2400 pounds gross weight.

43. Refer to Airplane Flight Manual for rate of climb data.

## **STALLS**

44. The stalling speed of the airplane is greatly affected by the flap position, power application, and the gross weight. The following power off stalling speeds have been determined by flight tests:

## STALLING SPEEDS

	2400 Lbs. Gross Weight	2000 Lbs. Gross Weight
Flaps UP	64.5	59
Flaps DOWN	61.5	56

## CRUISE

45. The cruising airspeed and engine rpm will depend upon the propeller installed on the airplane. Due to production variations, propellers of the same make and design will give different level flight, full throttle engine speeds. The following table will aid in determining the proper cruising condition at sea level for any one airplane.

## CRUISING DATA

<i>Level Flight Full Throttle</i>	<i>Cruising With 83% Power</i>			<i>Cruising With 75% Power</i>		
R.P.M.	R.P.M.	Gal./Hr.		R.P.M.	Gal./Hr.	
		Rich	Lean		Rich	Lean
2900	2730	11.8	10.9	2645	10.5	9.8
2850	2680	11.7	10.8	2595	10.4	9.7
2800	2630	11.6	10.7	2550	10.4	9.7
2750	2570	11.5	10.6	2500	10.3	9.6

Cruising with 83 percent power is the maximum cruising condition recommended. At 5000 feet altitude, full throttle may be necessary to obtain 83 percent power. It is suggested that the level flight, full throttle engine rpm be determined by trial.

46. The figures given in the gallons per hour column are gallons of fuel for each actual hour of flight time at the given rpm. The figures for lean operation are based upon flight tests with mixture leaned in accordance with the instructions given in Chapter I, paragraph 26, and with carburetor heat off. Use of carburetor air heat will increase fuel consumption. The figures are correct for a temperature of 60°F. Fuel consumption will increase at temperatures below 60°F. and increase at temperatures above 60°F.

47. Use carburetor air heater to prevent and eliminate carburetor ice and to maintain smooth full throttle operation of the engine. Icing conditions are most likely when the outside air temperature is between 20 and 68 degrees Fahrenheit. Engine may require heat for smooth operation at temperatures below 20 degrees F.

48. The airplane must be operated within the limits given in the CAA Approved Airplane Flight Manual.

## **APPROACH**

49. Determine fuel quantity in each tank and turn both the fuel valve and the indicator switch to the fullest tank.

50. Push mixture control in to *full-rich* position.

51. Set controllable propeller, on airplanes so equipped, in *High Rpm* position.

52. Pull carburetor heat control to *on* position and frequently open the throttle to clear the engine and to prevent too rapid cooling during the approach glide.

+ 53. Set the flap control in the second notch to lower flaps all the way for maximum lift and drag during landing. Do not lower flaps at airspeeds above 88 mph.

54. Set elevator trim tab to maintain desired gliding speed. Normal power off approach speed is 80 mph.

## **LANDING**

55. Refer to Airplane Flight Manual for the distances required for landing at various altitudes.

56. The steerable tail wheel should be used as the principal control for steering after contacting the ground in order to avoid excessive brake wear.

## **EMERGENCY TAKE-OFF IF NO LANDING POSSIBLE (BALKED LANDING)**

57. Push throttle smoothly to *full open*.



## OPERATING INSTRUCTIONS

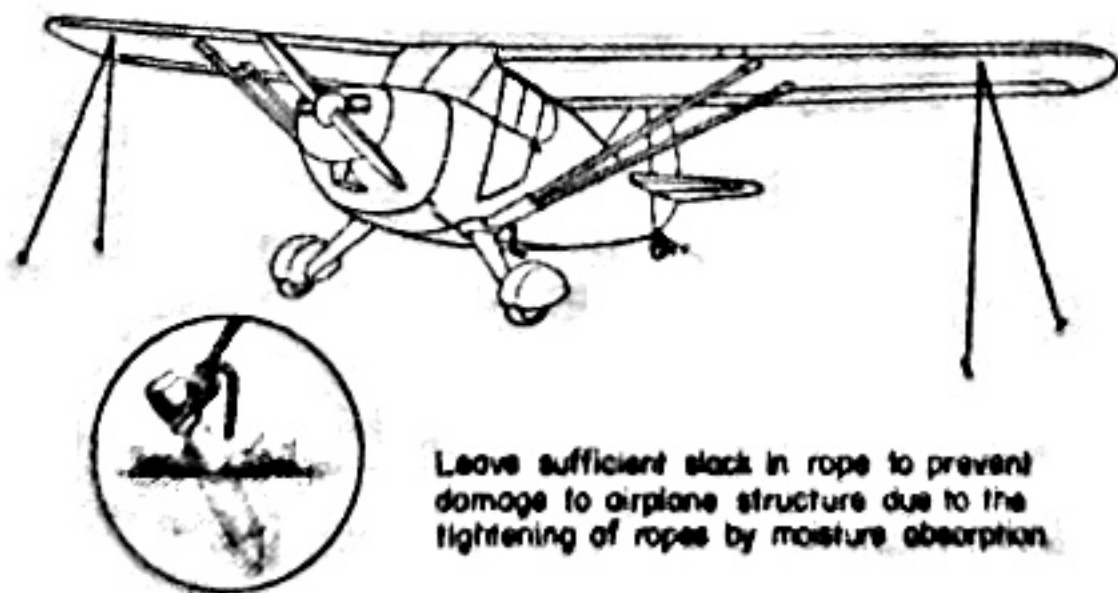
58. Push carburetor heat control to *off* position.
59. Hold the control wheel forward to prevent climbing until speed is regained.
60. Readjust elevator and rudder trim tab settings.
61. After regaining speed, raise flaps gradually to obtain best climb.

## STOPPING THE ENGINE

62. Idle engine at 800 rpm for minimum of one minute to allow proper cooling.
63. To stop the engine pull mixture control all the way out to *idle cut-off* and simultaneously push throttle to full *open*. After engine stops, turn ignition switch *off*. Leave mixture control in *idle cut-off* position as a precaution against accidental starting.

## BEFORE LEAVING AIRPLANE

64. Turn all switches off.
65. Set the parking brake.
66. Lower the flaps full down to prevent buffeting when parked outside.



Leave sufficient slack in rope to prevent damage to airplane structure due to the tightening of ropes by moisture absorption.

Figure 14—Airplane Hoisting

# PILOT'S CHECK LIST

## PRE-FLIGHT

Gross weight not over 2400 lbs.  
Ignition *off*  
Parking brake *set*  
Pitot cover *off*  
Check oil level  
Fuel tank caps *tight*  
Flight Controls—freedom and direction  
Elevator trim tab *neutral*  
Rudder trim tab *neutral*  
Master switch *on*  
Fuel quantity, *L* and *R* tanks  
Carburetor heat *off*  
Set altimeter  
Check radio  
Check lights

## STARTING ENGINE

Flaps *up*  
Radio *off*  
Throttle approximately  $\frac{1}{4}$  inch *open*  
Mixture *in* to *full-rich*  
Prime—3 strokes maximum (if engine is cold)  
Ignition to *start, both*  
Check oil pressure

## WARM-UP

Develop 20 psi oil pressure at 900 to 1000 rpm  
Warm-up at 1000 rpm  
Check instruments at 2000 rpm:  
Oil pressure 40 to 45 psi  
Oil temperature 60°  
Ammeter charging  
Check magnetos at 2000 rpm *R Mag—Both—L Mag—Both*

## TAXI

Flaps *up*  
Use rudder to steer

## **TAKE-OFF**

Parking brake *off*  
Mixture in to *full-rich*  
Carburetor heat *off*  
Flaps *up* (Flaps *down* 1st notch may be used at pilot's discretion)

## **CLIMB**

Climb speed: 82 mph  
Flaps *up*  
Set rudder trim tab

## **LIMITATIONS**

Do not exceed 158 mph at any time (Normal Category)  
Do not exceed 170 mph at any time (Utility Category)  
No acrobatics in Normal Category  
See cabin placard for acrobatics in Utility Category

## **APPROACH**

Mixture *in* to *full-rich*  
Fuel valve and gauge switch to fullest tank  
Carburetor heat *on*  
Clear engine periodically  
Flaps *full-down*  
Gliding speed 80 mph  
Set elevator trim tab  
Set rudder trim tab  
Throttle *out* to close

## **AFTER LANDING**

Carburetor heat *off*  
Flaps *up*

## **STOPPING ENGINE**

Mixture *idle cut-off* (full out)  
Ignition *off*  
Master switch *off*

## MAINTENANCE DATA LIST

TIRE PRESSURE	Gross Weight divided by 100
TIRE SIZE	7.00 x 6
OIL—Capacity	9 Quarts
Grade (Above 40°F.)	SAE 40
Grade (Below 40°F.)	SAE 20
FUEL—Capacity	50 Gallons (25 per tank)
Grade	80 Octane (minimum) Unleaded
BRAKE FLUID	AN-VV-O-366b Petroleum Base
USEFUL LOAD	1100 Pounds*
Baggage Compartment	100 lbs. max.
Cabin Floor (Voyager)	350 lbs. max.
Cabin Floor (Station Wagon)	600 lbs. max.
Fuel (full)	276 lbs.
Oil (full)	17 lbs.

\*Based on wt. empty of 1300 lbs. Check with Airplane Flight Manual.

### Notes:

When cleaning windows and windshield, do not use gasoline, alcohol, benzene, acetone, carbon tetrachloride, lacquer thinner, or window cleaning sprays. Use hand soap (mild) and warm water.

Keep cabin clear of loose articles.

✕ Bleed airspeed lines by disconnecting hose connections under left side of control panel. The frequency of this operation will depend upon atmospheric conditions.

Clean carburetor air filter frequently and dip in oil when operating in dusty atmosphere. See General Service Manual.