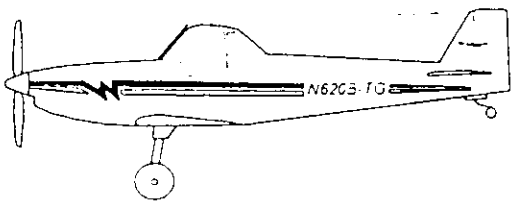
PILOT'S OPERATING HANDBOOK
and
FAA APPROVED AIRPLANE FLIGHT MANUAL

Model 620B-TG



Weatherly Aviation Company, Inc.
2100 Flightline Drive
Lincoln, CA 95648

FAA APPROVED

AIRPLANE FLIGHT MANUAL

for

WEATHERLY MODEL 620B-TG AIRPLANE

(Restricted Category)

Weatherly Aviation Company, Inc.
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Lincoln, CA 95648

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ANM-160L
Los Angeles Aircraft Cert. Office
Transport Airplane Directorate

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SECTION I
Limitations

The following limitations must be observed in the operation of this airplane.

Engine: ALLIED SIGNAL TPE331-1-151A, FLAT-RATED TO 500 SHAFT HORSEPOWER (SHP)

Engine Limits:

POWER SETTINGS	SHP (MIN)	TORQUE (PSI)	PROP SPEED % RPM[3a]	EGT (°C)	OIL PRES. (PSI)	OIL TEMP (°C)
STARTING				800[3]	50 TO 120	-40 TO 93
FLIGHT IDLE			66[1] OR 97.5[2]		"	"
TAKE-OFF	500	47	100	564[4]	"	"
MAX CONTINUOUS	500	47	100	564[4]	"	"

[1] SPEED LEVER LOW
[2] SPEED LEVER HIGH
[3] 1 SECOND
[4] Std. temp. and pres. (see below for other)
[3a] 100% = 2000 PROP RPM = 41,730 ROTOR RPM

EGT MAX LIMITS VS. OAT
TAKE-OFF OR MAX CONTINUOUS

OAT (°F)	EGT (°C)
-58	532
-40	535
-22	538
-4	543
14	548
32	553
50	560
68	568
86	576
104	585
122	595

If at take-off and max continuous power these OAT versus EGT limits are exceeded, the engine flat-rated shaft horsepower is not assured.

Propeller & Propeller Limits: McCauley p/n 3GFR34C602/100LA-2 with Spinner p/n E4858
Flight idle pitch setting 12°±½° at 30" station
Maximum RPM 2000 (100%)

Fuel type:
Jet A (Allied Signal EMS 53111)
Jet A-1 (Allied Signal EMS 53112)
Jet B (Allied Signal EMS 53113)
JP4 (Allied Signal EMS 53113)
JP5 (Allied Signal EMS 53116)

When operating at ambient temperatures of 0 °C or below the fuel must contain an icing inhibitor, the quantity not to exceed 0.15% by volume in compliance with MIL-I-27686D or E.

Oil type:

Allied Signal Specification	Equivalent Military Specification	Brand Name Equivalents	
EMS53110 Type I	MIL-L-7808D	Texaco SATO 15 Sinclair Turbo S Oil 15 Caltex SATO 15 British Petroleum Aero Turbine Oil 15	Brayco 880 Conojet Continental Conojet Regent SATO 15
	MIL-L-007808F	Stauffer Jet I Brayco 880H	Hancock Airturb Syn Lube
	MIL-L-7808G	Stauffer Jet I	Exxon 2389
EMS53110 Type II	MIL-L-23699B	Mobil Jet Oil II Aeroshell Turbine Oil 500 Exxon (Enco/Esso) 2380 Turbo Oil Chevron Jet Engine Oil #5	Texaco SATO 7730 Stauffer Jet II Castrol 205 Cal Tech RPM Jet Engine Oil #5

Note: Fuel capacities are in U.S. gallons, equivalent in brackets (liters).

Oil capacities are in U.S. quart, equivalent in brackets (liters).

Fuel capacity: 130 gal.[492ℓ] total, 116 gal.[439ℓ] usable.

Oil Capacity: 6.25 qt.[5.9ℓ], 5.25 qt.[5.0ℓ] usable.

Maximum Gross weight: 4300 lb.[1950 kg.]

Hopper Capacity: 2000 lb.[907 kg.]

Baggage Capacity: 25 lb.[11.34 kg.]

Datum: Leading edge of wing, outboard of fillet

C.G. Range: +19.5 inches to +26.5 inches aft of datum, all weights

Air Speed Limits:

Note: The maximum operating speed V_{mo} must not be deliberately exceeded in any regime of flight (climb, cruise or descent).

Without spreader

V_{mo} - Maximum Operating 176 mph (153 knots) IAS

V_{no} - Normal Operating 140 mph (122 knots) IAS

V_A - Maneuvering 129 mph (112 knots) IAS

V_Y - Best Rate of Climb 90 mph (78 knots) IAS

With spreader installed
V_{mo} - Never exceed 155 mph (135 knots) IAS

Altitude: Maximum operating 15,000 ft. (4572 meters) density altitude

Temperature: Maximum operating ambient 110°F (43.4°C). Flight into known icing conditions is prohibited. Do not fly into areas of visible moisture when the temperature is below 40°C.

Type of Operations: Agricultural applications

Limit Load Factors: +3.8, -1.9

Maneuver Limitations: No acrobatics or spins

Noise Certification:

This airplane has not been shown to comply with the noise limits in FAR Part 36 and must be operated in accordance with the noise operation limitation required by FAR 91.815.

Instrument Markings:

Note: All instruments, including an OAT gauge in degrees Fahrenheit, must be operative for engine operation and flight. Unless otherwise noted green arcs indicate normal operating ranges during flight, and yellow arcs indicate caution.

Tachometer	Red Line	100%
	Green Arc	96% to 100%
	Yellow Arc	65% to 96%
Torque Pressure	Red Line	47 psi
Oil Temperature	Red Line	-40°C and 93°C
	Green Arc	55°C to 79°C
	Yellow Arc	-40°C to 55°C
		79°C to 93°C
Oil Pressure	Red Line	50 psi and 120 psi
	Green Arc	70 psi to 120 psi
	Yellow Arc	50 psi to 70 psi
Air Speed Indicator	Red Line	176 mph
	Yellow Arc	140-176 mph
	Green Arc	65-140 mph

Note: Red line indicates the maximum operating speed. The yellow arc indicates the range in which the aircraft should fly in calm air only with light controls movements. The Green arc indicates the normal operating speeds with the bottom of the green arc indicating power off stall speed.

Fuel Pressure	Red warning light 50 psi high and 15 psi low, see required placard below.
Fuel Quantity Gauge	Markings per drawing #72563. Empty mark indicates 14 gallons unusable fuel remaining, and red arc extends from E to lowest reading possible in level flight.
Exhaust Gas Temp.	See required maximum EGT placards below.

Required Placards: <u>On the Instrument Panel:</u>

"THIS AIRCRAFT APPROVED FOR VFR DAY OR NIGHT OPERATION ONLY. THI AIRPLANE MUST BE OPERATED AS A RESTRICTED CATEGORY AIRPLANE I COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM O PLACARDS, MARKING, AND MANUALS. DESIGN MANEUVERING SPEED 129 MPH MAXIMUM DEMONSTRATED CROSSWIND VELOCITY 15 MPH (13 Knots). WIT TRANSLAND P/N 20241 SPREADER INSTALLED DO NOT EXCEED 155 MPH. FLIGH INTO KNOWN ICING CONDITIONS IS PROHIBITED."

"<u>FUEL PRESSURE</u> MAX. 50 PSI, NORMAL OPERATING 20 PSI TO 50 PSI, CAUTION 15 PSI TO 20 PSI, MIN. 15 PSI"

"DO NOT RELY ON FUEL FLOW INSTRUMENT TO DETERMINE FUEL LEVEL IN TANKS"

"PARKING BRAKE, DEPRESS PEDALS AND PULL ON, PUSH TO RELEASE"

"TO UNLOCK TAIL WHEEL PUSH STICK FORWARD"

"NO SMOKING"

"CAUTION - CHECK BOTH TIP VANES FOR EXTENDED POSTION PRIOR TO TAKE-OFF"

"PULL EMERGENCY FUEL OFF/PROP FEATHER"

"CAUTION - OVER HEATING OF THE LUCITE LENS WILL OCCUR IF LANDING LIGHTS OR TURN LIGHTS ARE ON FOR PERIODS OVER 10 SECONDS WHILE AIRCRAFT IS ON THE GROUND" (REQUIRED FOR NIGHT LIGHT OPTION ONLY)

"130 U.S. GAL.[492ℓ] TOTAL, 116 U.S. GAL.[439ℓ] USABLE, 58 U.S. GAL.[219.5ℓ] EACH SIDE"

"MAX. 800°C ONE SECOND" (At EGT gauge)

" "

EGT MAX. LIMITS

OAT(°F)	EGT(°C) START	EGT(°C) ENRICH
ALL	800	700

OAT(°F)	EGT(°C) TAKE-OFF 100%RPM	EGT(°C) CRUISE 96%RPM
-58	532	486
-40	535	490
-22	538	496
-4	543	502
14	548	508
32	553	516
50	560	524
68	568	534
86	576	543
104	585	554
122	595	570

At Entrance to Cockpit:
"RESTRICTED"

At Oil Filler Neck:
"OIL TANK CAPACITY 6.25 QT., TURBINE OIL ONLY. REFER TO AIRPLANE FLIGHT MANUAL FOR PERMISSIBLE OIL DESIGNATIONS"

At Right and Left Fuel Tank Filler Necks:
"FUEL: JET A, JETB. FOR OTHER FUELS REFER TO AIRPLANE FLIGHT MANUAL. CUATION: ALLOW SUFFICIENT TIME FOR INTERCONNECTED TANKS TO FILL WHEN TOPPING OFF."

On Baggage Shelf Aft of Pilot Seat in Cockpit:
"BAGGAGE LIMIT 25 LBS" (11.34 Kilo.)

At Hopper Compartment Filler Door:
"2000 LBS. MAX" (907 KILO.)

SECTION II
Normal Operation and Procedures

ENGINE OPERATION

General Description

The Allied Signal (previously known as Garrett) engine Model TPE331-1 is a light weight single shaft turboprop engine. It extracts power by converting heat energy into a rotating mechanical energy. Ambient air is drawn in and compressed by a two-stage centrifugal compressor. Exiting the 2nd stage diffuser, air is directed into the annular combustion chamber and mixed with fuel. The fuel/air mixture is ignited and continuous combustion is maintained. The expanding gases enter the turbine nozzle area, experiencing further flow acceleration due to the convergent turbine nozzle design. Nozzle directed airflow impinges upon the first stage turbine rotor, causing it to rotate. The hot gases continue their flow through the remaining nozzles and turbine rotors, and finally back to the atmosphere as exhaust.

Turbine engines achieve their highest efficiency at or near a single RPM design point. Therefore, the TPE331 has been designed to operate in a narrow RPM range. Power management is that function which maintains a constant speed by controlling the excess of the turbine power to equal propeller load.

Engine cooling is accomplished by use of the engine exhaust augmenter. The exhaust augmenter is the portion of the exhaust tube which exits the side of the aircraft. This exhaust tube is larger in diameter and overlaps the exhaust tube attached to the rear of the engine. Air in the engine compartment is sucked into the gap between the two exhaust tubes which causes the heat to be extracted from the engine compartment.

A hydraulically actuated, constant speed, full feathering propeller control system is an integral feature of the engine. The Propeller Governing System incorporates Negative Torque Sensing (NTS) System and is interconnected with the Fuel Control System. The NTS system automatically moves the propeller blades toward a high pit position which decreases propeller drag in the event of fuel starvation or engine shut-down. In the event of NTS System failure the propeller can be manually feathered by use of the Emergency Fuel Off/Prop Feather T-handle.

During flight, the Propeller Governing System automatically maintains set engine speed by varying the pitch of the propeller blades in response to changing conditions of flight. After landing, manual (Beta) control of the propeller blade angle is available, providing flat pitch (high drag) or reverse thrust to assist in deceleration.

Controls

The TPE331 has only two engine control levers - the Power Lever and the Speed Leve There is also a T-handle which is pulled in emergency situations to stop the engin and feather the propeller.

The *Power Lever* is the larger of the two levers on the throttle quadrant located o the left side of the cockpit. It has two detents built into it - the flight idle stop and the ground idle stop. The Power Lever can only be moved aft of the detent by pulling the release lever, which is built onto the Power Lever, with the index finger. During flight the power lever must never be brought behind the flight idl stop. Once on the ground the Power Lever can be brought behind the flight idle st to the ground idle stop to reduce thrust, noise, and fuel consumption. Moving

behind the ground idle stop will produce reverse thrust for deceleration on the landing roll out or for ground maneuvering.

The Power Lever is primarily used to control output power. Whether it is fuel or blade angle depends upon the mode of operation. In flight the Power lever, when advanced forward from the flight idle stop, controls fuel flow, similar to a reciprocating engine throttle. During this mode, the propeller governor automatically maintains set engine speed by varying propeller blade angles in response to changing flight conditions and/or power. On the ground the Power Lever, when retarded behind the flight idle stop, controls propeller blade angle directly. This mode is called Beta Mode.

The *Speed Lever* is the smaller lever on the throttle quadrant, also referred to as the Condition or RPM Lever. It serves one function, which is to select the engine operating speed. Normal Speed Lever positions are high, cruise, and low. High (100% RPM) position is used for takeoff and landing, cruise (96-97% RPM) for normal climb, cruise, or descent operations, and low (65-73% RPM) for engine starting and ground or taxi operation.

The *Emergency Fuel Off/Prop Feather T-handle* is located on the far left side of the instrument panel. In emergency conditions to shut-down the engine and feather the propeller the handle should be pulled. The fuel control valve will be manually (no electrical power required) closed as the T-handle is pulled through the first half of it's travel, and the propeller feather valve manually activated during the last half of travel. The T-handle must be twisted to lock it in the fully extended propeller feather position.

Engine Instruments

Torque of the engine is indicated by the *Torque Pressure* gauge. The standard torque-sensing system is composed of two major components - the torque sensor and the torque compensator. The torque sensor provides an oil-pressure signal proportional to the engine torque absorbed by the propeller and accessories, which are driven from the gearbox. The torque compensator modifies this signal level to provide a consistent relationship between the indicated pressure and torque of the engine. The Torque Pressure gauge indicates torque therefore by measuring pressure at the torque compensator in psi. Although the TPE331 is capable of developing 665 shp, the torque pressure gauge is red lined at 47 psi, which is the equivalent of 500 shp. Care must be taken not to exceed this red line as the airframe has not been approved for more than 500 shp.

The *Tachometer* gauge is calibrated in percent RPM, with 100% always being used for takeoff and landing.

The digital *EGT* gauge indicates exhaust gas temperature in degrees centigrade at the engine tail pipe. The placard above the EGT gauge indicates starting, take-off, and continuous red-line limits which must not be exceeded. To avoid exceeding EGT limits during a start-up the *Emergency Fuel Off/Prop Feather T-handle* is used to abort the start. During flight the *Power Lever* is retarded or the *Speed Lever* advanced to lower EGT readings. A red warning light is built into the gauge which illuminates when 800 C° is exceeded, as placarded on the gauge.

The *Oil Temperature* and *Oil Pressure* gauges read psi and degrees centigrade respectively.

The digital *Fuel Flow/Pressure* gauge displays fuel flow or fuel pressure at the inlet to the engine driven high pressure fuel pump. The gauge display is selectabl by means of five push buttons on the gauge, which also include calculated fuel remaining, fuel burned, and time to empty. The fuel pressure reading should be monitored to avoid exceeding limits as noted on the fuel pressure placard above the gauge.

Also incorporated into the gauge are a low and high fuel pressure red warning light and a low fuel quantity red warning light. Either of these lights will activate regardless of the selected display. The low and high fuel pressure warning is programmed to 15 psi and 50 psi respectively, which coincide with the placard above the gauge. When activated the light will begin blinking. Pushing any button or switch will then cause the light to go solid red.

The low fuel quantity reminder is programmed to blink the low fuel quantity warning light when the calculated time to empty is below 20 minutes, or when the calculated fuel remaining is below 20 gallons. When blinking this light may be turned off by pushing any button or switch on the gauge. However the light is programmed to begi blinking again if the calculated low fuel remaining level reaches 10 gallons. Pushing any button or switch at this time will cause the blinking light to go solid red (same as low and high fuel pressure warning above). These programmed settings are performed at the factory and should not be altered. Keep in mind however to always rely on the fuel quantity gauge as the primary fuel quantity indicator.

When the Master switch is turned on the *Fuel Flow/Pressure* gauge will perform a self-diagnostics test and flash both warning lights. This allows you to check the LED's for proper operation. After power-up the gauge will then blink the low fuel quantity warning light. The light will blink until any button or switch is pushed. This is intended as a reminder to update the calculated fuel remaining if fuel has been added to the aircraft since the last flight. Refer to the Fuel Flow/Pressure Gauge Operation Manual for instructions on how to update the fuel remaining and for additional operating information.

The *Volt/Amperage* gauge indicates voltage and amperage of the electrical system. To switch from voltage to amperage reading or vice versa the mode toggle switch on the gauge is used. Note that the amperage reading indicates the amperage between the battery and the electrical system, and not the output of the generator. During operation the amperage should always read zero or positive, which indicates proper battery charging. The gauge also incorporates an over voltage red warning light and battery discharge red warning light.

Engine switches

The engine switches are located on the lower right side of the instrument panel. They are located in a logical order as to their operation during starting and shut down.

The first switch is the *Fuel Off* switch which is used in standard procedure for engine shut-down. The switch incorporates a safety cover to avoid accidental shut down of the engine during operation.

The *Auxiliary Fuel Pump* switch activates the air frame mounted auxiliary fuel pump used during starting and emergency situations.

The *Generator/Starter Mode* switch is used to switch the engine mounted starter/generator between start and generate modes.

The *Starter* switch is used to activate the starter and ignitors during engine start. The starter switch will not function without the Generator Mode switch in the start mode position.

The *Fuel/Enrich* switch is used for two functions. It's first purpose is to open the electrically activated solenoid valve which initiates fuel flow from the fuel control unit to the combustion chamber. Secondly, it is used to perform the enrichment function after the fuel solenoid valve has been opened. Fuel enrichment aids in engine acceleration during starting by increasing fuel flow to the combustion chamber.

The *Ignitor Air Start* switch is only used during air restarts or emergency procedures. It activates the ignitors without activating the starter.

The *Prop Un-Feathers* switch activates an electrical pump which un-feathers the propeller for air restarts, and for returning the propeller to the start locks with the engine off before starting in the event the start locks are not engaged prior to start.

Engine Warning Lights

The six primary engine warning lights are located on the upper left side of the instrument panel. They all have a push to test capability, and can be dimmed by rotating the lens cover.

The red *Beta* warning light which indicates when the engine is operating in beta mode. It will illuminate during ground operations when the Power Lever aft of flight idle, or during flight when the Power Lever is at flight idle and the aircraft is at slow speeds. The beta light should not be illuminated during a normal landing approach.

The green *Ignition* warning light indicates when the ignitors are on such as during ground and air start procedures. After engine starting when the Starter Switch is turned off the Ignition light should go out. During flight the Ignition warning light should illuminate only if the Ignitor Air Start Switch is turned on.

The yellow *Generator* light indicates when the generator is in start mode, and should go out when the Generator/Starter Mode Switch is positioned in Generator Mode. Except for starting, this switch should always be in Generator Mode to allow power to be supplied to the electrical system.

The yellow *Chip* light indicates metal chips in the oil system. If the light is illuminated land as soon as practical. Do not fly until the problem is rectified.

The yellow *Fuel Filter* light indicates the air frame mounted fuel filter is contaminated and the fuel filter is by-passing. If the light is illuminated land as soon as practical. Do not fly until problem is rectified.

The yellow *NTS* light is used to check the Negative Torque Sensing (NTS) system. The light is controlled by a pressure switch in the propeller hydraulic system. The NTS system is checked by activating the *Prop Un-Feather* switch before a start which pressurizes the propeller hydraulic system and turns the NTS light on. If the *Emergency Fuel Off/Prop Feather T-handle* is then pulled the propeller feather valve is actuated which relieves pressure in the system to allow the propeller blades to feather and turn off the NTS light. The *Emergency Fuel Off/Prop Feather T-handle* is then pushed full in and the NTS light should re-illuminate. Continuing with the

start procedure when the starter is activated the light should go out at initial engine rotation (noted by the NTS system as negative torque), and then illuminate at engine start to indicate correct operation of the NTS system.

A red warning light is also located above the Oil Pressure gauge, and above the Fuel Gauge. The Low Oil Pressure warning light illuminates if the oil pressure drops below 60 PSI, and the Low Fuel Warning light illuminates if the fuel level falls below approximately 5 gallons.

As mentioned previously in the Engine Instruments section, the EGT gauge incorporates an over temperature red warning light, and the Fuel Flow/Pressure gauge incorporates low fuel pressure and low fuel quantity red warning lights.

The over voltage and battery discharge red warning light incorporated into the *Volt/Amperage* gauge should be monitored during flight. Illumination of either light during operation indicates a malfunction of the generator and/or electrical system. If either light illuminates during flight land as soon as soon as practical and rectify problem before continuing operation.

OPERATING PROCEDURES

Pre-Flight

The airplane should be given a visual walk-around inspection prior to flight. The pre-flight starts at the cockpit on the left side of the aircraft and is carried out in a orderly walk around of the aircraft.

__ If night flight check operation of all lights.
__ Release control stick lock in cockpit.
__ Check underside of aft fuselage for visible signs of damage, and inspection panels secure.
__ Check all control surfaces for damage and for unrestricted movement. Check control surface hinges.
__ Check tail wheel lock for free movement of the lock pin. Check tail wheel assembly for proper lubrication and operation and tire for condition and inflation (45 psi).
__ Check static air port on right side of aft fuselage for possible obstruction.
__ Check right side aft fuselage panels secure.
__ Check right spray boom and hangers secure (if installed).
__ Check right aileron for damage and for unrestricted movement, and hinges for general condition.
__ Check mounting of right wing tip vane and in extended position.
__ Check right wing fuel vent for obstruction.
__ Check right landing light lens for condition and mounting.
__ Visually check fuel at right fuel filler and fuel cap securely fastened.
__ Check right wing leading edge for damage.
__ Check pitot tube for possible obstruction.
__ Check right landing gear assembly and tire for condition and inflation (45 psi).
__ Drain two right fuel tank drains. Check for water or sediment.
__ Check underside of right wing for visible signs of damage.
__ Check spray equipment right side of gate box to spray pump. Check spray pump and control linkage.
__ Check right side engine cowling and panels secure.
__ Open engine inspection panel and check oil filler cap secure. If engine has not been run for several days, the oil level should be checked. Care should be taken to avoid overfilling. Occasionally, oil may be trapped within the engine and will not show on the sight-gauge or dipstick. To assure a valid oil level check, the engine should first be motored up to 15>, or with a low battery, the propeller should be pulled through by hand for a minimum of 2 minutes. The correct time to check the oil level is within one hour after shutdown when oil is distributed throughout the engine as it is in operation and near operating temperatures.

Note: To motor engine without starting turn *Master* on, *Generator/Starter Mode* switch to start mode, and *Starter* switch on. Do not actuate *Fuel/Enrich* switch. To stop motor turn *Starter* switch off.

__ Check oil filter bypass for extended red pin indicating a restricted oil filter element.
__ Check exhaust stack cover removed and clear.
__ Check propeller for general condition and nicks. Nicks must be repaired per the propeller maintenance manual before flight. Check prop spinner for security and oil/grease leaks from the propeller hub.
__ Check propeller blades are on the start locks (flat pitch 1-2 degrees). If the blades are in feather they can be moved to the start lock position by means of the unfeathering pump. See engine operation section for this procedure.

__ Pull propeller blades through two complete revolutions checking for free rotation and abnormal noise.
__ Check engine inlet for obstructions. Check sensors are clean and undamaged.
__ Check for damage to first stage compressor fan by turning the propeller slowly in normal direction of rotation.
__ Check oil cooler air inlet clear.
__ Check left side engine cowling and panels secure.
__ If used check external power (GPU) for proper hook-up and voltage setting (28-24 Volts).
__ Drain two fuel drains at fuel filter left side of aircraft aft of firewall. Check for water or sediment.
__ Check spray equipment plumbing left side of aircraft. Check spray valve and gate box linkage.
__ Check spreader and supports if installed.
__ Drain center and left fuel tank drains, four total.
__ Check underside of left wing for visible signs of damage.
__ Check left landing gear assembly and tire for condition and inflation (45 psi).
__ Check left wing leading edge for damage.
__ Visually check fuel at left fuel filler and fuel cap securely fastened.
__ Check left landing light lens for condition and mounting.
__ Check left wing fuel vent for obstruction.
__ Check mounting of left wing tip vane and in extended position.
__ Check left aileron for damage and for unrestricted movement, and hinges for general condition.
__ Check left spray boom and hangers secure (if installed).
__ Check aircraft orientation into wind. Note strong tail winds or winds directed directly at exhaust pipe during start can create excessive propeller loads, hot starts, and/or re-ingestion of exhaust gases.

Before starting engine

__ Seat belt and shoulder harness adjusted and fastened.
__ All electric switches "OFF".
__ Set cabin heat switch to "OFF".
__ Controls unlocked and check for proper movement.

Engine Start

Note - Engine starts can be made with aircraft battery power or with auxiliary dc electrical power (GPU). It is recommended that a GPU be used when ambient air temperature is 10 °F or below. Be sure that the GPU is regulated to 28 volts dc maximum and capable of providing a minimum of 16 volts dc, 800 amperes during the starting cycle. The GPU plug is located on the left side of the aircraft in the engine nacelle adjacent to the firewall.

Note - Before starting engine after an engine start abort, clearing of fuel or vapors from the engine is accomplished by allowing 3 minutes for fuel to drain from the engine, or by motoring the engine with the starter, without turning fuel/enrich switch on. Do not attempt to start until indicated EGT is less than 200 °C.

__ *Speed Lever* low.
__ *Power Lever* between ground idle and flight idle.
__ Check propeller un-feathered. If feathered turn *Prop Un-feather* switch on, move *Power Lever* into reverse, and observe blade angle until the propeller blades have moved to the locked position. Then turn *Prop Un-feather* switch off and return *Power Lever* between ground idle and flight idle position.
__ Check all engine switches in "OFF" position (down).

__ *Master* switch "ON".
__ Reset fuel quantity on Fuel Flow/Pressure gauge to actual fuel quantity if fuel has been added to aircraft since last flight (see Fuel Flow/Gauge Operation Manual).
__ *Fuel Selector* lever on.
__ Raise safety cover of engine *Fuel Off* switch and guard during start and activate if an abort is required. Also guard *Emergency Fuel Off/Prop Feather T-handle* with left hand during start-up in case of electrical malfunction which leaves the engine *Fuel Off* switch inoperable.
__ *Auxiliary Fuel Pump* switch on, verify fuel pressure 3 psi minimum on fuel pressure gauge.
__ *Generator/Starter Mode* switch up for start mode.
__ Clear prop.
__ Perform NTS check on first flight of day by first activating *Prop Un-Feather* switch. Note NTS light on. Pull *Emergency Fuel Off/Prop Feather T-handle* full aft and note NTS light goes out. Push *T-handle* full in and light should re-illuminate. Continue start procedure below. NTS light should go out at initial engine rotation, and then illuminate at engine start. If NTS check is unsatisfactory continue engine start and run engine until 55 °C oil temperature is achieved. Shut down engine and perform NTS check again. If still unsatisfactory do not fly aircraft until problem is corrected.
__ *Starter* switch on.
__ Watch for slow engine acceleration, which could cause high EGT and possibly require an aborted start. Engine should accelerate to 10% RPM within 10 seconds
__ *Fuel/Enrich* switch on at 10% RPM to initiate fuel. After 12 the *Fuel/Enrich* switch is further used for fuel enrichment to aid engine acceleration. Repetitive momentary movements of the *Fuel/Enrich* switch upward are more effective than maintaining the switch in the up position. Monitor the *EGT* gauge closely during start-up. The fuel enrichment function should not be used above 700 °C because it can cause the EGT to rise extremely fast and exceed the maximum engine EGT limit of 800 °C. If light-off is not indicated by a rise in EGT within approximately 10 seconds after reaching 10 rpm or by 20 rpm, abort the start by turning the *Starter* switch off and activating the engine *Fuel Off* switch. If oil pressure is not indicated within 10 seconds after engine light-off also abort start. In case of electrical malfunction the *Emergency Fuel Off/Prop Feather T-handle* must be pulled to abort start.
__ Continue monitoring EGT. If RPM stops increasing prior to 40 , or if the EGT is approaching the engine limit of 800 °C and rising rapidly, perform engine start abort. Exceeding 800 °C EGT may seriously damage the engine.
__ Above 80% RPM turn *Starter* switch off, and *Generator/Starter Mode* switch to generate position. Turn *Prop Un-Feather* switch off (if on from NTS check above)
__ *Auxiliary Fuel Pump* switch off.
__ Check fuel pressure 15 psi minimum at idle RPM.
__ Oil pressure and temperature check.
__ Perform over speed governor check first flight of day. With propeller still on start locks move Speed Lever to high, and Power Lever slowly forward until RPM stabilizes. The RPM should be between 103-105 (if not, adjust over speed governor per engine maintenance manual before flight).

Taxi

__ Check GPU disconnected if used.
__ Volt/amp gauge check. Amp meter should indicate charge.
__ Check brakes released.
__ Take prop off start locks by moving *Power Lever* slowly towards reverse, while observing the beta light. If beta light goes out, stop movement of power lever

until beta light re-illuminates, then move *Power Lever* slowly toward reverse until approximately 150 lb./hr fuel flow is indicated and engine torque increases. Now move *Power Lever* back to start position. The propeller start locks are now disengaged.

__ Check *Speed Lever* low
__ *Power Lever* advance slowly as required.
__ Steering on the ground is done by braking alternate main wheels. The stick must be pushed forward to unlock the tail wheel to allow it to swivel.

Ground run-up

__ Caution - The brakes will not hold the aircraft with full power. Do not attempt full power ground run-ups unless the tail is tied down.
__ Check propeller beta mode by moving *Power Lever* aft of flight idle. Beta light should illuminate and reduced thrust should be noted. As *Power Lever* is moved into reverse, reverse thrust should be produced.
__ Check all instruments normal.
__ Perform under speed governor check high and low first flight of day. With Speed Lever at high position, and Power Lever at ground idle the RPM should be between 94.5-96.5%. Now move the Speed Lever to the low position and the RPM should be between 64-66%. If either setting is not in the correct range make adjustments to the under speed governor per the engine maintenance manual before flight.

Note: engine fuel pressure should be monitored during flight.

Take-off

__ Cabin heat and air conditioner off. Cabin heat operates from bleed air pressure which causes a slight loss in available horsepower. The air conditioner draws high amperage from the generator which also causes a slight loss in power.
__ *Speed Lever* high.
__ Move *Power Lever* slowly forward. Do not exceed torque red-line 47 psi or EGT limit as noted in placard.
__ Start take-off roll with stick back of neutral position to lock tail wheel.
__ After reaching 25 mph IAS raise tail for take-off.
__ Use right rudder as required to keep the aircraft on the center line.

Climb

__ *Speed Lever* high.
__ *Power Lever* forward. Do not exceed torque red-line 47 psi or EGT limit as noted on placard.
__ Climb at 80-95 mph depending upon load and atmospheric conditions.

Cruise

__ *Power Lever* back as required.
__ *Speed Lever* back as desired for cruise RPM (96-100 RPM).
__ Adjust *Power Lever* as necessary, do not exceed torque red-line 47 psi or EGT limit as noted on placard.

Descent

__ *Speed Lever* high.
__ *Power Lever* back as required. Use 115 mph IAS for normal enroute descent. Avoid prolonged steep glides (nose down more than 8° for more than 1,000 feet altitude loss) if fuel level is below 1/4 tank marks because fuel outlet is at rear of tank. If fuel pressure should drop during a steep descent, raise nose of aircraft immediately.

Approach for landing

__ *Speed Lever* high.
__ *Power Lever* back as required. Use 80-90 mph for normal approach speed.
__ Land 3 point or on the main wheels. Be sure to pull stick all the way back to lock tail wheel when tail wheel contacts the ground. Move the stick forward of neutral position to unlock tail wheel before attempting to turn aircraft on the ground.
__ If desired use beta range of power lever once on the ground to reduce landing roll.
__ In cross wind landings, make wing low, wheel landing if cross wind is in excess of 7 mph (6 knots).

Taxi and shut down

__ *Speed Lever* low.
__ *Power Lever* as required.
__ Push stick forward to unlock tail wheel during turns.
__ Allow EGT to stabilize by running the engine with *Speed Lever* low and power at ground idle for a minimum of 3 minutes prior to shutdown, taxi time included.
__ All electrical systems off except master switch.
__ *Fuel Off* switch "OFF", hold for a minimum of five seconds to assure complete discharge of the fuel purge accumulator. The fuel purge system will not totally purge unless a minimum engine RPM of 95% is attained during the operation cycle.
__ Move *Power Lever* into reverse before engine speed falls below 50% to secure propeller on the start locks.
__ Monitor engine spool down time, verifying it is consistent with previous shutdowns.
__ Reset the *Power Lever* to flight idle following engine shutdown.
__ *Master* switch "OFF".
__ Lock flight controls.
__ Hand rotation of propeller in normal direction of rotation limits peak post shutdown engine temperature and will enhance fuel nozzle life.
__ Secure aircraft.

Engine post flight check

__ Check oil quantity.
__ It is desirable to check the oil filter bypass indicator immediately following engine shutdown in order to allow for maximum trouble shooting time if necessary.
__ Install engine intake and exhaust cover after 15 to 30 minutes cooling period.

Agricultural operations

The chemical hopper should be rinsed and allowed to air-out after each days operations. The bottom gate should be left open, if the hopper is empty. The pilot/operator must comply with federal, state and local regulations controlling cleaning and disposal of chemical residues.

Operation of the Weath-Aero controllable spray pump windmills requires certain precautions. To avoid damage from rocks or other objects to the fan blades, take-off and land with the blades in feathered position. Do not operate continuously with the fan blades in full flat position (high RPM) at airspeeds above 140 mph. Reduce speed if difficulty is experienced in moving the blades from flat pitch to feathered position. Always have the blades in feathered position if flying with an empty or very low spray tank. Some slow rotation of the fan with the blades in feathered position is normal. If the rotation is rapid, the control rigging and operation should be checked and corrected.

Night operations

The installation of the night light electrical system provides lighting for night agricultural operations. This system includes navigation lights, strobe wing tip anti-collision lights, overhead cockpit lights, instrument panel lights, a 600 W. forward directed light in each wing and a 450 W. canted light in each wing for turn reference. Switches for operation of the landing lights and systems are located to the lower left of the instrument panel. The forward directed light beam may be tilted up or down through a range of about 15° by use of toggle switches. The landing lights are activated by first arming one or both by means of the toggle switches, and once armed the lights may then be turned on or off by pressing the top trigger button on the control stick grip. The bottom trigger button operates the auto-flag solenoid, when one is installed.

The right and left turn lights are turned on or off with the left and right buttons on the top of the stick grip. Care should be taken to avoid activating the turn lights inadvertently during the day.

The overhead cockpit lights and panel lights turn on when the navigation lights are turned on. The overhead cockpit lights may be independently controlled by the rheostat switch on the back of each light. They may also be switched from white to red by rotating the lens on the front of the light.

The instrument panel lights are dimmed by use of the rheostat. The engine warning lights may also be dimmed independently by turning their lens covers.

Additional Operation Manuals

Refer to the following manuals which are included with the aircraft, when applicable, as listed below.

-ELECTRONIC FUEL FLOW/PRESSURE GAUGE
-WEATH AERO FAN
-AUTO FLAGMAN
-CROPHAWK
-SMOKER
-PNEUMATIC SPLIT BOOM SPRAY SYSTEM
-WAG AIR CONDITIONER
-WAG FLAGGER GPS SYSTEM

SECTION III
Emergency Procedures

Note: The engine is equipped with an NTS (negative torque sensor) system as described in section 2, which automatically moves the propeller blades toward a high pitch position in the event of an engine failure to reduce propeller drag. Although this position is not a fully feathered position and has a slightly higher drag than a feathered propeller, it provides time for the pilot to react to the engine failure and to pull the emergency engine off handle, which causes the prop to fully feather.

Engine Failure in Flight

__ Pull *Emergency Fuel Off/Prop Feather T-handle.*
__ Move *Power Lever* to full forward position, to drive propeller blades to a low drag position in the event of NTS system or feather valve malfunction.
__ Nose down to gliding flight 80-90 mph. If engine can not be restarted or altitude is limited perform emergency landing.

Caution: If the engine failure is caused by flame-out, it is possible that the engine may re-light immediately if the ignition is turned on by means of the Ignitor Air Start switch. After activating the Ignitor Air Start switch if the engine does not re-light immediately revert to the engine failure procedure above. If the engine does re-light and the flame-out was possibly caused by weather conditions such as rain, the ignitors may be left on until the conditions are passed. If the engine does re-light and the cause of the flame-out is not evident, the ignitors should be left on and a landing made as soon as soon as practical and further flights suspended until the cause of the flame-out is determined and corrected.

Emergency Landing

__ Maintain gliding flight 80-90 mph.
__ All electrical "OFF".
__ Fuel Selector "OFF".
__ Perform landing as required.

Air Start from Feather

Note - Do not engage starter during air start, because the high torque requirements of a feathered propeller will damage the starter.

__ Air Speed 80 mph to 140 mph as required.
__ EGT below 200°C.
__ RPM less than 10%.
__ *Emergency Fuel Off/Prop Feather T-handle* in.
__ *Power Lever* one inch forward of flight idle.
__ *Speed Lever* cruise position.
__ *Auxiliary Fuel Pump* switch "ON".
__ *Prop-Unfeather* switch "ON".
__ At 10% RPM *Ignitor Air Start* switch "ON", *Fuel/Enrich* switch "ON".
__ Use *Fuel/Enrich* switch for enrich function as needed for satisfactory engine acceleration.
__ Check for immediate fuel flow indication above 10% RPM.
__ Check rise in EGT between 10-20% RPM. Observe EGT limits. If rise in EGT is not indicated by 25% RPM, abort start by switching the *Fuel Off* switch "OFF" and pulling *Emergency Fuel Off/Prop Feather T-handle.*

Aborted Air Start

__ *Fuel Off* switch to "OFF".
__ Pull *Emergency Fuel Off/Prop Feather T-handle.*
__ If aborted air start is due to no combustion attained, reduce altitude and airspeed if possible before attempting another air start.
__ If aborted air start is due to high EGT, reduce altitude and increase airspeed if possible before attempting another air start.

Power-Plant Control Malfunction

Should there be an indication of improper operation of the fuel control or propeller control, it is recommended that the handling characteristics of the aircraft be checked by a simulated landing flare at a safe altitude before landing is attempted. It is recommended that if unusual drag is noted, the engine should be shut-down and the prop feathered.

Engine Fire in Flight

__ Pull *Emergency Fuel Off/Prop Feather T-handle.*
__ Turn fuel selector lever to "OFF".
__ Cabin heat "OFF".
__ Perform emergency landing.

Engine Fire on Ground

__ Pull *Emergency Fuel Off/Prop Feather T-handle.*
__ Turn Fuel Selector lever to "OFF".

Erratic Torque Indication

If an abrupt loss or an excessive fluctuation of torque indication occurs (±4 psi), immediately shut down the engine.

SECTION IV
Performance

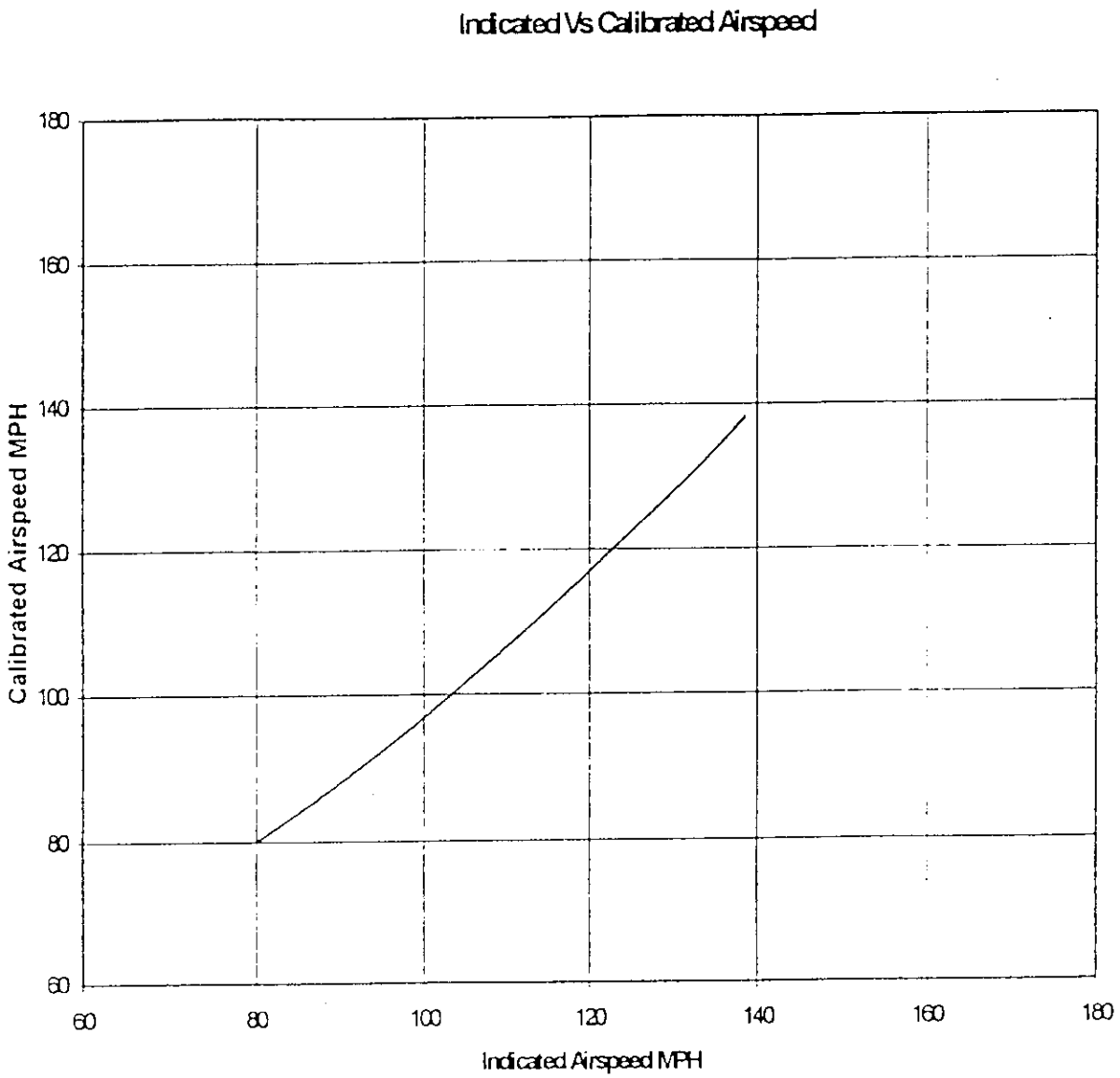
Note - The charts on the following pages reflect the performance of the 620B-TG airplane in factory standard condition, with factory standard spray equipment installed. Furthermore the air in the standard atmosphere is assumed to be perfectly dry (containing no water vapor). At sea level the standard temperature is 59 °F and the barometric pressure is 29.92 inches of mercury. In the real atmosphere, some water vapor is nearly always present and if the humidity is quite high, significant loss in aircraft performance will occur. This is because water vapor is lighter than air. Air turbulence will also cause a loss in performance.

The FAA approved design gross weight for this aircraft is 4,300 lb. (1950 kg.). The approved design structural limit for the wing is 4,800 lb. (2177 kg.). The maximum approved maneuvering speed is 129 mph. Although current FAA regulations permit agricultural loads over the above limits, it is the responsibility of the pilot to perform these operations safely. Sharp pull-ups should be kept below the maneuvering speed limit. The performance curves for 5900 lb. (2676 kg.) gross weight in this section are for reference only.

Stall

POWER OFF STALLING SPEEDS AT VARIOUS ANGLES OF BANK
STD. TEMP. AND PRES.

Bank Angle	0°	30°	45°	60°
Stall Speed MPH @ 4,300 lb.	65	70	77	92
Stall Speed MPH @ 5,900 lb.	77	83	92	109


Indicated Vs Calibrated Airspeed
Calibrated Airspeed MPH
180
160
140
120
100
80
60
60
80
100
120
140
160
180
Indicated Airspeed MPH

SECTION V
Loading

Weight and Balance

Standard and optional equipment including weights and locations are listed below and a blank weight and balance sheet included on the following page to assist in determining weight and balance when changes to the basic aircraft or loading are made. If re-weighing of the aircraft is required first drain all fuel from the tanks and fuel lines by means of the six drain valves under the wing center section, and the two drain valves below the airframe mounted fuel filter at the bottom left aft side of the firewall. After the fuel has been completely drained add 14 gallons of fuel (unusable), divided equally between the right and left tanks. The engine oil tank should be at full capacity.

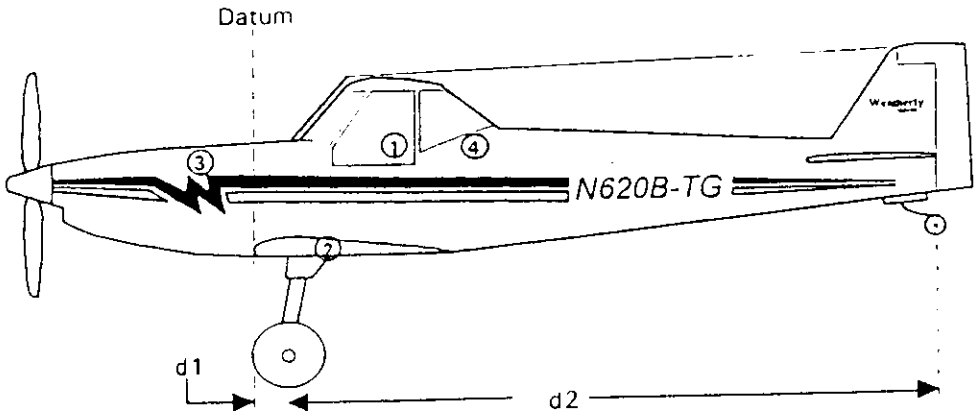
Place the weighing scales under the wheels and then level the aircraft. Use the leveling tabs welded to the fuselage frame on the outer side of the frame in the cockpit area for longitudinal leveling, and along the wing center-section main spar for lateral leveling. Record the net weights and obtain wheel base distances d1 and d2 from the original weight and balance form. Use the weight and balance form on the following page to make the new center of gravity calculations. Update the Equipment List and make the proper aircraft log book entries. The C.G. position limits shown on the weight and balance form are valid for all approved weights.

Approved Options Model 620B-TG

ITEM	DESCRIPTION		WEIGHT(lb.)	LOCATION(*)
External Spray Booms	Dwg 50863		41.0	80.5
Spreader	Transland #20241		68.0	35.0
Hopper Sump	Transland #21997		25.5	14.0
Bottom Load Tube	Dwg 50306		4.2	59.3
Spray Pump	Dwg 50304		29.0	4.5
Weath-Aero Fan	Dwg 50304		11.0	-10.0
Auto-Flagman	Empty		14.5	49.0
	Full		28.5	49.0
Crophawk	EO #2236		4.0	40.0
Windshield Washer	Dwg 50010-201	Empty	3.0	70.0
		Full	21.0	70.0
Wag GPS	EO #2237		28.9	52.8
Air Conditioner	Dwg 50010-383		88.0	-13.0
Pneumatic Spray System	EO #2234		30.0	84.7

* Location in inches from datum (leading edge of wing, negative direction fwd)

WEATHERLY AVIATION CO., INC.
Weight and Balance Report
Model 620B-TG



S/N: Reg. No.: Date:

	Item	Weight (lb.)	Arm (in.)	Moment (in. x lb.)
	Basic Airplane			
1	Pilot	170.0	73.0	12410.0
2	Fuel		36.0	
3	Hop. Load		15.0	
4	Baggage		93.3	
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
	Sum:			

C.G. limits (in.)
19.5-26.5

C.G. (in.)

Notes:
1. Total weight equals sum of right wheel, left wheel, and tail wheel weights.
2. Airplane basic weight equals total weight.
3. Airplane basic arm equals the sum of main wheel weights multiplied by distance d1, plus the tail wheel weight multiplied by the sum of d1 and d2, all divided by the total weight.
4. Moment is equal to the weight multiplied by the arm.
5. C.G. is equal to the sum of the moments divided by the sum of the weights.