## SECTION 1 - LIMITATIONS

### GENERAL:

Operations in compliance with the limitations presented in this section are required by the Federal Aviation Regulations.

### AIRSPEED LIMITATIONS:

| SPEED | CAS | IAS | REMARKS |
|---|---|---|---|
| Maneuver ($V_a$) | 140 mph<br>122 kts<br>225 km/h | 138mph<br>120 kts<br>222 km/h | No full or abrupt control movements above this speed |
| Maximum Flap Extended ($V_{fe}$) | 115 mph<br>100 kts<br>185 km/h | 118 mph<br>102 kts<br>190 km/h | Do not exceed with fully extended flaps |
| Maximum Structural Cruising ($V_{no}$) | 140 mph<br>122 kts<br>225 km/h | 138 mph<br>120 kts<br>222 km/h | Do not exceed in turbulent air. |
| Never Exceed ($V_{ne}$) | 155 mph<br>135 knts<br>249 km/h | 153 mph<br>133 kts<br>246 km/h | Do not exceed in any operation. |

### AIRSPEED INDICATOR MARKINGS: (NOTE 2)

| MARKING | CAS VALUE OR RANGE | IAS VALUE OR RANGE | SIGNIFICANCE |
|---|---|---|---|
| White Arc | 69 to 115 mph<br>60 to 100 kts<br>111 to 185 km/h | 70 to 118 mph<br>61 to 102 kts<br>113 to 190 km/h | Full flap operating range. Lower limit is maximum weight stalling speed and upper limit maximum permissible (with flaps extended). |
| Green Arc | 83 to 140 mph<br>72 to 122 kts<br>134 to 225 km/h | 82 to 138 mph<br>71 to 120 kts<br>132 to 222 km/h | Normal Operating Range. Lower limit is maximum weight stalling speed and upper limit is maximum cruising (with flaps retracted). |
| Yellow Arc | 140 to 155 mph<br>122 to 135 kts<br>225 to 249 km/h | 138 to 153 mph<br>120 to 133 kts<br>222 to 246 km/h | Operations must be conducted with caution and only in smooth air. |
| Red Line (NOTE 1) | 155 mph<br>135 kts<br>249 km/h | 153 mph<br>133 kts<br>246 km/h | Maximum speed for all operations |

NOTE 1: $V_{ne}$ speed may be increased to 176 mph (153 kts)(283 km/h) CAS (174 mph) IAS when p/n HC-B3TN-3D/T10282NS+4 Hartzell Propeller is installed. Red line on airspeed indicator is to be changed to 176 mph CAS (174 mph IAS) and yellow arc extended to 176 mph CAS (174 mph IAS) when this propeller is installed.

NOTE 2: Australian registered aircraft require markings in Kts IAS.
Brazil requires markings in Kts CAS.
Canadian registered aircraft require markings in mph IAS.
U.S. and Other Countries require markings in mph CAS.
Chinese aircraft require markings in km/h CAS.

**WEIGHT LIMITS:**

| | |
|---|---|
| Maximum Take Off Weight: | 8,000 lbs. (3,629 kg.) |
| Maximum Landing Weight: | 8,000 lbs. (3,629 kg.) |
| Baggage Compartment: | 60 lbs. (+98 in.) (27kg. at +249 cm) |
| Maximum Hopper Load: | 4,100 lbs. (1,860 kg.) at +12.0 in. (+30.5 cm)<br>(500 U.S. Gallons at +12.0 in)<br>(1,893 liters at +30.5 cm) |

NOTE: It is the responsibility of the airplane owner and operator to insure that the airplane is properly loaded. See Weight and Balance data for proper loading instructions.

**CENTER OF GRAVITY LIMITS:**

(+18.0 in.) (45.7 cm) to (+24.0 in.) (61.0 cm) at 8,000 lbs (3629 kg.)
(+18.0 in.) (45.7 cm) to (+28.0 in.) (71.1 cm) at 6,980 lbs (3166 kg.)

Datum is wing leading edge.

**MANEUVER LIMITS:**

No acrobatic maneuvers, including spins, are approved.

**FLIGHT LOAD FACTOR LIMITS:**

| | Flaps Retracted | Flaps Extended |
|---|---|---|
| Maximum Positive | +3.8 | +1.9 |
| Maximum Negative | -1.9 | 0.0 |

**FLIGHT CREW LIMITS:** One (1) pilot (+74.0 in.) (+188 cm)
One Crew (+107.0 in.) (+272 cm) when optional Crew Seat installed in accordance with Dwg 11524.

**KINDS OF OPERATION:**

This airplane is certificated in the RESTRICTED CATEGORY for Agricultural and Forest/Wildlife Conservation special purposes and is eligible for the following kinds of operations when the appropriate instruments and equipment required by the airworthiness and/or operating regulations are installed, approved, and are in operable condition.

a. DAY VFR

b. NIGHT VFR (Only if Strobe lights, instrument, flap and dome lights are installed per drawing 60004).

c. Flight into icing conditions is prohibited.

d. Night work operations are prohibited unless appropriate working lights are installed and operable.

e. Flight in vicinity of thunderstorms prohibited.

**PLACARDS AND MARKINGS:**

The following information on placards pertaining to flight and operating limitations must be displayed:

(a) On All Canopy Doors: RESTRICTED

DO NOT OPEN DOORS IN FLIGHT

IF DOORS WILL NOT OPEN AFTER OVERTURN,
KICK OUT WINDOWS WITH KNEES OR FEET.

(b) Attached to outside of aircraft:

(1) Next to fuel filler caps:
FUEL 63* GAL. [238 Liters] JET A. FUEL TANKS ARE INTERCONNECTED. ALLOW SUFFICIENT TIME FOR FUEL LEVEL TO EQUALIZE BEFORE TOP-OFF OF TANK.
*85 GAL. [322 Liters] (When standard 85 gallon tanks are installed)
*108 GAL. [409 Liters] (When optional 108 gallon tanks are installed)
*117 GAL. [443 Liters] (When optional 117 gallon tanks are installed)

(2) Next to Oil Filler Cap: OIL TANK 9.2 QUARTS [8.7 Liters] CAP.

(3) Next to pitot static buttons: STATIC AIR – KEEP CLEAN

(4) On hopper lid: FOR AGRICULTURAL PURPOSES:
MAX HOPPER LOAD 4,100 LBS. [1860 KG.]
MAX AIRCRAFT GROSS WT. 9,400 LBS. [4264 KG.]

(5) On side of engine air scoop: LEVELING POINT.
Planes with nose-mounted ram air engine inlet have placard above left hand gear leg that reads LEVELING POINT IS TOP OF GEAR LEG 5° TAIL DOWN.

(6) On baggage door: 60 POUNDS [27.2 KG.] MAXIMUM BAGGAGE.

(7) Below Hopper Rinse Fill: HOPPER RINSE TANK FILL

(8) Below Windshield Washer Fill: WINDSHIELD WASHER FILL

(9) On Canopy Doors: EMERGENCY EXIT OPEN

(10) In loader seat compartment (if installed): OCCUPANT MUST ATTACH SEATBELT AND SHOULDER HARNESS AND WEAR A D.O.T. APPROVED OR MIL-SPEC CRASH HELMET.

(11) On Canopy Doors: RESCUE

(c) In full view of pilot:

(1) THIS AIRPLANE MUST BE OPERATED IN RESTRICTED CATEGORY IN ACCORDANCE WITH PLACARDS AND MARKINGS DISPLAYED IN THE COCKPIT. NO ACROBATIC MANEUVERS, INCLUDING SPINS. DESIGN MANEUVERING SPEED 140 MPH [122 KNOTS] (225 km/h). MAX FLAP DOWN SPEED 115 MPH [100 KNOTS] (185 km/h). MAX CROSSWIND VELOCITY DURING LANDING 15 MPH [13 KNOTS] (24 km/h). ALT. LOSS FROM STALL 220 FT (67 m).

(2) THE OPERATION OF THIS AIRPLANE IS LIMITED TO DAY AND NIGHT* VFR CONDITIONS. FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED.
*Delete the words AND NIGHT unless aircraft is equipped with operable lighting package. (see page 6)

(3) PUSH STICK FORWARD TO UNLOCK TAILWHEEL. **(NOTE 1)**

(4) PARK BRAKE OPERATION: ON: DEPRESS PEDALS AND PULL LEVER
OFF: DEPRESS PEDALS.

**PLACARDS AND MARKINGS (Continued):**

(5) DO NOT OPERATE ENGINE ABOVE 800 FT-LBS TORQUE ON GROUND RUN-UP OR TAIL WILL COME UP.
FLIGHT IN VICINITY OF THUNDERSTORMS PROHIBITED.
FLIGHT IN VISIBLE MOISTURE BELOW 40°F PROHIBITED.
FLIGHT BELOW -5°F [-15°C] PROHIBITED.
USE FSII WHEN OPERATING BELOW 40°F [+4.4°C].
MAXIMUM OPERATIONAL ALTITUDE 12,500 FT [380 m] MSL.

(6) WARNING DO NOT MOVE POWER LEVER INTO REVERSE POSITION WITH ENGINE STOPPED OR CONTROLS WILL BE DAMAGED.

(7) DO NOT OPERATE PUMP ABOVE 140 MPH. [122 KNOTS] (225 km/h)

(8) WARNING: SULFUR DUSTING IS PROHIBITED UNLESS SPECIAL FIRE PREVENTION MEASURES ARE INCORPORATED IN AIRCRAFT.

(9) On engine Control Quadrant at respective HI and LO Idle positions:
FLIGHT IDLE and RUN.
On Start Control Lever: S.

(10) On aft end of Engine Control Quadrant next to Power Lever: REV.
At the stop detent: IDLE.
On Power Control Lever: POWER.

(11) On Prop Control Lever: P and on aft end of travel: F

(12) Below Caution Lights on Upper Panel: LOW FUEL, FUEL FILTER, CHIP DETECT, AIR FILTER, PROP IN BETA, RINSE PUMP, GENERATOR OUT

(13) Emergency Power Lever (If Installed):
On top of Lever:
CAUTION FCU OVERRIDE
UNLOCK - PUSH FOR POWER

(14) On instrument panel if loader seat is installed:
WHEN OPTIONAL LOADER SEAT IS OCCUPIED THE HOPPER RINSE TANK MUST BE FILLED WITH WATER AND/OR FUEL QUANTITY MUST BE ADJUSTED TO PREVENT EXCEEDING THE AFT C.G. LIMIT OR WEIGHT LIMIT. LOADER SEAT MUST NOT BE OCCUPIED DURING CHEMICAL APPLICATION

(15) On instrument panel: A STALL DURING SKIDDING TURNS WILL CAUSE THE NOSE TO PITCH DOWN SHARPLY AND RESULT IN SIGNIFICANT LOSS OF ALTITUDE. MAINTAIN COORDINATED FLIGHT AT ALL TIMES

(16) WARNING: TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT THROUGH CLOUD, FOG, OR HAZE. STANDARD POSITION LIGHTS TO BE ON FOR ALL NIGHT OPERATIONS.

(17) On instrument panel: AVOID SKIDDING TURNS WHICH MAY RESULT IN FUEL MIGRATION FROM ONE TANK TO THE OTHER. THE ENGINE MAY QUIT WHEN EITHER TANK BECOMES EMPTY. MONITOR THE FUEL LEVEL IN EACH TANK FREQUENTLY WHEN FUEL LEVEL IS LESS THAN 1/2 TANK.

(18) On floor next to Emergency Engine Induction door cable (If Installed): TURN TO UNLOCK, PULL UP FOR EMERGENCY ENGINE INDUCTION SYSTEM

**CRUISE:**

1. Reduce propeller RPM to approximately 1800 RPM. Use higher RPM with heavy loads (Such as 2000 RPM with full hopper).
2. Reduce torque to comfortable setting and check ITT limit does not exceed nominal 675°C for -15AG or -27 engine installations or 740°C when either a -34 or -34AG or -34B or -36 engine is installed.
3. Calculate horsepower so as not to exceed 620 SHP. Formula is as follows: SHP = rpm (Np) x K x Torque, where K = .00019
4. Check that the engine Control Quadrant friction knob is tight enough to prevent creep of Prop and Start Control levers during Power Lever movements.
5. If severe turbulence is encountered, the igniter switch should be placed in the "Continuous" position as the turbulence could cause a temporary fuel interruption and subsequent flame-out. With the ignitor in the Continuous position, an immediate re-light will in all probabilities occur.
6. In cruise conditions where the O.A.T. is below 40°F (5°C) the PY heater (Anti-icing) switch should be ON.

**AGRICULTURAL FLYING:**

Since agricultural flying is extremely varied, it is not practical to recommend operating procedures which in many cases would not fit a particular operation. However, the procedures outlined in this section are general and may be followed if they apply.

Survey of field:

1. Before entering the field to be treated, fly around the entire perimeter at least once to firmly establish the location of wires, stand pipes, or other obstacles.
2. Determine direction field will be flown and check position of flagmen if used.
3. Check surrounding area on downwind side for possible drift damage.
4. Make note of houses or areas to avoid during turns.

Entering Field:

1. If practical, make first pass into the wind so that two passes will be made before the first downwind turn is required. Avoid making first pass into the sun, however.
2. If obstructions border the field reduce speed slightly and make a high approach. When obstruction is near enough, nose down smoothly to an angle which will clear obstruction and apply power to prevent high-speed stall on roundout. Avoid flying just above obstruction height and abruptly pitching over.

Swath: (Spraying)

1. For a full load on a hot day set prop at 2100 RPM and at 1200 ft.lbs. torque or less, depending on how well the aircraft is performing.

**AGRICULTURAL FLYING (Continued)**

Swath: (Spraying) (Continued)

2. Spray runs may be made at 135 to 140 mph (117 to 122 kts) (217 to 225 km/h) (IAS) when the aircraft is heavy, which will provide good penetration as well as adequate speed for pull-ups and turns.
3. As load diminishes, reduce RPM by 50 RPM increments so that as hopper nears empty, RPM is 2,000.
4. Reduce torque pressure as load diminishes to avoid excess speed over the crop, which reduces penetration. Spray speeds of 130 to 135 mph (113 to 117 kts) (209 to 217 km/h) (IAS) are normal as the hopper nears empty.
5. The operator should select a speed which feels comfortable and best fits his particular operation. In gusty air always use 5 to 7 mph (4 to 6 kts) (8 to 11 km/h) (IAS) more speed during turns when loaded.

Pull-Ups:

1. Prior to pull-up apply additional power smoothly.
2. Abrupt pull-ups should be avoided since excessive speed is lost which reduces turn performance.
3. When making pull-ups over wires avoid starting to bank too soon.

Turns:

1. The previous training and experience will influence the operator flying the AT-502B. All conventional types of turns may be performed in the AT-502B.
2. Flaps may be used as a turning aid providing small deflections are used (5 to 8 degrees). The usual method of using flaps is to make the pull-up and initial bank with flaps retracted. As the aircraft is being banked to turn back into the field touch the flap switch briefly and let off a little back pressure on the stick, as the flaps cause a slight pitch up tendency. Continue the turn, and as you line up for your pass, retract the flaps.
3. Make coordinated turns. Use the slip indicator as a means of determining whether or not you are carrying bottom rudder. The AT-502B has excellent stall characteristics and if the aircraft is inadvertently placed in an impending stall situation, it is only necessary to relax some back pressure on the stick to make recovery, and little altitude is lost, providing the turn is coordinated. A stall from a skidding turn will result in the nose dropping sharply with a significant loss of altitude.
4. In addition to being hazardous, a skidding turn can transfer fuel from one tank to another, which will result in flameout if one tank runs dry. Monitor the fuel level in each tank when the fuel level reaches 1/2 tank. Fuel transfer can occur when flying a racetrack pattern if the turns are not coordinated.

**EMERGENCY FUEL CONTROL OVERRIDE (IF INSTALLED):**

PT6A engines may have a manual FCU Override feature as a means of restoring and controlling engine power in case of power loss due to P-3 system malfunctions in the FCU.

The Emergency Power Lever for the FCU override system is located in the cockpit to the left side of the pilot's seat within easy reach of the pilot. Except when use, the lever must remain locked in its upper position (OFF).

**FOR EMERGENCY OPERATION:**

To use the Emergency Power Lever, grasp the lever and depress the unlock trigger lever located on the bottom side of the Emergency Power Lever. With the unlock lever depressed, the Emergency Power Lever is free to be rotated downward for power application. Fly the aircraft using the Emergency Power Lever for power as necessary and land as soon as practical.

**SPINS:**

The spinning characteristics of this aircraft have not been fully investigated and spin recovery techniques have not been established. In the event of an inadvertent spin the following procedure is suggested:

1. **Reduce POWER to idle** - The torque of an engine producing power will make spin recovery more difficult.
2. **AILERONS neutral** - Attempting to level the wings with aileron input can actually make the spin worse.
3. **Apply FULL OPPOSITE RUDDER to stop the rotation** - Apply rudder opposite the rotation of the spin. If you have trouble determining which way the airplane is spinning, look at your turn coordinator or turn needle. It will indicate the direction of rotation.
4. **Apply FORWARD ELEVATOR to break the stall** - Immediately after applying opposite rudder, apply a quick forward motion on the control stick and hold anti-spin controls until the aircraft starts to recover.
5. **RECOVER from the dive** - Once you have completed the four previous steps, and the rotation stops, recover from the dive. The descent rate may be high and the airspeed can rapidly exceed redline. Remember to neutralize the rudder after the rotaion stops.

**COCKPIT DOOR OPENS IN FLIGHT**

1. Do not attempt to close door.
2. Gently maneuver aircraft avoiding abrubt control inputs, stall speed may have increased.
3. Land as soon as practical.

**FLIGHT OVER WATER:**

Generally over-water flights are made with the ferry fuel system installed so that hopper fuel is available. The flight manual procedures for using hopper fuel should be followed.

Use hopper fuel first. Switch to main tank fuel while there is still fuel in the hopper and turn fuel boost pump ON for a minute or two, then OFF.

All over-water flights should be at an altitude that will provide ample time to receive a response to a Mayday call, or to restart the engine if there is fuel interruption.

**ENGINE FAILURE OVER WATER:**

Page 25 describes the conditions for engine failure as basically mechanical failure. These conditions would include loud noises followed by heavy vibrations, loss of power, sudden increase in ITT, or engine explosion. For these conditions follow the flight manual procedures and prepare for ditching.

## STALL SPEEDS

Stall Speeds at 5,600 lbs. (2,540 kg.) gross weight, power idle are as follows:

| Angle of Bank (Degrees) | 0 | 15 | 30 | 45 | 60 |
|---|---|---|---|---|---|
| Stall Speed (MPH-IAS) Flaps Up [KTS](km/h) | 68 [59] (109) | 69 [60] (111) | 73 [63] (117) | 81 [70] (130) | 96 [83] (154) |
| Stall Speed (MPH-IAS) Flaps Down [KTS](km/h) | 58 [50] (93) | 59 [51] (95) | 62 [54] (100) | 70 [61] (113) | 83 [72] (134) |

Stall Speeds at 8,000 lbs. (3,629 Kg.) gross weight, power idle are as follows:

| Angle of Bank (Degrees) | 0 | 15 | 30 | 45 | 60 |
|---|---|---|---|---|---|
| Stall Speed (MPH-IAS) Flaps Up [KTS](km/h) | 82 [71] (132) | 83 [72] (134) | 88 [76] (142) | 98 [85] (158) | 115 [100] (185) |
| Stall Speed (MPH-IAS) Flaps Down [KTS](km/h) | 69 [60] (111) | 71 [62] (114) | 75 [65] (121) | 83 [72] (134) | 99 [86] (159) |

## ALTITUDE LOSS DURING STALL RECOVERY:

The maximum altitude lost in the wings level stall recovery is 220 ft. (67m) for the AT-502B at gross weight of 8,000 pounds (3,629 kg.).