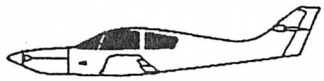
Normal Procedures
Section IV

Table of Contents



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SAFE OPERATING AIRSPEEDS

NOTE

All airspeeds in this section are indicated airspeeds (IAS) and assume zero instrument error. You should make sure your system has been correctly calibrated and account for those errors as necessary.

NOTE

BEST AIRSPEEDS WILL VARY BASED ON INDIVIDUAL BUILDERS' AIRCRAFT and THE PILOTS TECHNIQUE

Max Demonstrated X-WIND Component - 20 kts

3

Express Speeds, FG & RG

1) Take-off, Flaps UP

Rotation, -	65 - 70 kts (75-80 mph)
50 feet -	65 kts (75 mph)

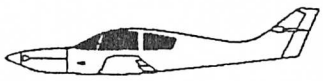
2) Take-off, Flaps, APPROACH (1/3)

Best Angle of Climb -	65 kts (75 mph)
Best Rate of Climb -	70 kts (80 mph)
Cruise Climb -	90-100 kts (104-115 mph)

3) Landing Approach

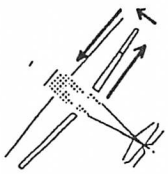
Flaps DOWN (1/3) -	65 kts (75 mph)
Flaps UP (0° deg, faired) -	70 kts (80 mph)

4) Balked Landing Climb - 70 kts (80 mph)
(On establishment of positive climb)



PREFLIGHT INSPECTION

COCKPIT - (Checklist)



ITEM	CONDITION
1. Control Lock	REMOVE
2. Avionics master switch	OFF
3. Master Switch	ON
4. Fuel Quantity gauge	CHECK
5. Lights (If night flight)	CHECK
6. Flaps	Down
7. Pitot Heat (if IFR/IMC flight)	ON 10 sec.,then OFF
8. All Switches	OFF

WALK AROUND INSPECTION - (Checklist)
(Starting at Right Wing/Fuselage)

ITEM	CONDITION
1. Right Flap Attach'mt, (lower side)	Secure
2. Right Aileron-	Trim tab Pin - Safetied
Control Hinges-	Secure, no loose screws
Motion	Free
Span Edges-	No contact with tip or flap
3. Wing Tip-	No damage, cracked paint, light secure
	Landing light
4. Wing Upper/Lower surface	Sight- smooth,
Inspection plates (3 round, 1 gear)	In place, secure
Leading Edge Feel-	smooth, no damage, clean
Speed brakes	Secure, free, no chafing of cable
Fuel Quantities-	Adequate for flight, Caps secure
5. Right Main Gear	
Tire	Condition/Tread
Chocks	Removed
Brake Pads	Condition
Brake Line	No chafing
Gear fairing/strut inflation	Secure,/3-4 inches

ITEM	CONDITION
6. Right Nose Area	
Main Fuel Sump	Drain, Check for contamination
Tire	Condition/Tread
Chocks	Removed
Gear/strut (RG)	Fairing secure/3 to 4 inches
Cowling/latches	Secure
Cooling intakes	No obstructions, bird nests, etc.
7. Prop & Spinner	Secure, no nicks, cracks in bulkhead

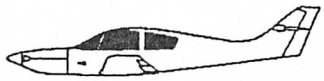
WARNING

Always assume the propeller is "Hot" and the engine ready to start when handling the propeller regardless of mag switch position.

CAUTION

*** See Propeller manufacturers instructions for nick and damage treatments and limitations. Damaged propellers are dangerous- failures can be catastrophic.**

Spinner	Secure, no cracks at attach screws
Blades	LE smooth, no nicks (dress as req'd)*
8. Left Nose Area	
Oil Quantity	___ Above mfg's minimum
Dip Stick	Replaced and Secure
Inspection Door	Closed/Secure
9. Left Main Gear	
Tire	Condition/Tread
Chocks	Remove
Brake Pads	Condition
Brake Line	No chafing
Fairing/strut	Secure/3-4 inches



10. Left Wing Upper/Lower surface — Sight- smooth,
- Inspection plates (3 round, 1 gear) — In place, secure
- Leading Edge Feel- — smooth, no damage, clean
- Speed brakes — Secure, free, no chafing of cable
- Fuel Quantities- — Adequate for flight, Caps secure
- Pitot probe — Secure, free of obstructions or cover **(Check heat if IFR)**

11. Wing Tip — No damage, cracked paint, secure, Pos lt.

12. Left Aileron
- Trim tab Pin or fixed tab — Safetied, secure
- Control Hinges — Secure, no loose screws, free motion
- Span Edges — No contact with tip or flap

13. Left Flap
- Attach Points — Ck Secure, but slight movement

14. Tail Assembly
- Horizontal Stabilizer — No leading edge damage
- Vertical Stabilizer — No leading edge damage
- Elevator/Rudder — Free motion, no rubbing
- Hinges — SECURE and safetied
- Rudder cables — SECURE, no bending of cable to fitting

15. Right Fuselage — No damage, cabin step secure

BEFORE STARTING - (Checklist)

1. Baggage — Stowed, loose items SECURED
2. Seat Belts/Shoulder Harness — Adjusted & SECURE
3. Brakes — SET
4. Circuit Breakers — Checked and IN
5. Master Switch — OFF
6. Avionics Master Switch — OFF
7. Avionics Switches — OFF
8. Door — LATCHED

STARTING - (Checklist)

1.	Master Switch	ON
2.	Fuel Quantity	RE-CK, ADEQUATE FOR FLIGHT
3.	Alternate Air	OFF
4.	Mixture	Lean
5.	Throttle	OPEN 1/4 inch
6.	Propeller	IN (max rpm)
7.	Boost Pump	ON
8.	Mixture, Full rich (5 counts), Lean,	Boost Pump OFF
9.	Clear Propeller	LOOK and Call "CLEAR"
10.	Starter	ENGAGE
11.	Magneto	BOTH (at cranking speed)
12.	On Start, Throttle full Rich	Adjust to 1000 rpm
13.	Oil Pressure	CHECK (within 30 sec or shutdown)
14.	Flaps	UP (or to Take-off setting

[A good time to review Wx briefing, T.O. "Go-No's", etc.]

15.	Alternator	ON
16.	Avionics Master Switch	ON
17.	Radios/Avionics	ON (as req'd)

7

COLD STARTING

Cold starts are similar to normal starts except that more fuel may be required. For temperatures below 0°F preheating of the engine may be desirable as well as use of a warm battery. Care must be used to limit operation of the starter motor to 30 seconds for each 4 minute period to allow internal windings to cool. Also oil pressure will take longer than normal to indicate.

(Operation in very cold climates or atmospheres, may suggest the addition of a cooling air baffle over at least a portion of the oil cooler to prevent excessively cold oil temperatures during flight.)

FLOODED ENGINE - (Starting Checklist)

1. Mixture	CUT-OFF
2. Propeller	HIGH RPM
3. Throttle	1/2 OPEN
4. Crank engine, mags	BOTH
5. Upon start, Throttle	IDLE (≈1000 rpm)
6. Mixture	RICH

HOT STARTING

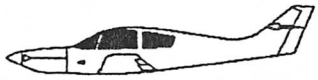
Starting a hot engine (aircraft or auto) can be difficult. This is particularly true with fuel injected engines and is generally due to vapor lock in the fuel system. All engines vary in their starting characteristics within the same models due in part to technique. Installation effects, fuel, battery condition etc. can all play a part. Cold engines will have one starting characteristic, another when hot after 10 or 15 minutes, and perhaps another after 30 minutes or so. Some experimentation and taking notes as to the technique that works, as well as advice from others who operate the same model engine can be helpful. The hot start technique is often similar to a flooded engine start.

WARNING

Be sure to allow adequate cooling periods between starting attempts and avoid long continuous periods of cranking as damage to the starter will result.

NOTE

Should a backfire occur during any start, continue cranking to draw any fire back into the engine. If backfiring continues or an engine compartment fire starts, shut down and EXIT the aircraft. Use fire extinguisher to extinguish any fire.



PRE-TAXI CHECKS - (Checklist)

1. Taxi Clearance	Obtain and **read-back**
2. Clear aft area for personnel and aircraft **prior** to power application (propeller blast)	Visually check "Clear"
3. Brakes	CHECK (at initial movement) (Be alert for sponginess or excessive pedal travel)

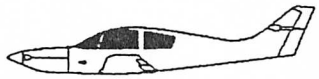
PRE TAKE-OFF RUN-UP - (Checklist)

1. Door	LOCKED and double checked
2. Area	CLEAR (Clear for rocks, clear for prop blast)
3. Brakes	LOCKED ON (and brakes held ON)
4. CHT/Oil Temp	GREEN
5. Throttle	1700 - 1800 RPM
6. Propeller (controllable)	CYCLE TWICE
7. Mags	CHECK (Max 150 drop, 50 rpm delta)
8. Carb Heat/Alt air	Check for RPM DROP
9. Instrument Air (Vacuum)	CHECK (4.3 - 5.9 in. Hg.)
10. Throttle	IDLE, then 1000 rpm

9

BEFORE TAKE-OFF - (Checklist)

1. Door	LOCKED (recheck)
2. Seat Belts/Harness	SECURE, and tight
3. Instruments	CHECK (DG, eng. & flt instm'ts)
4. Fuel Quantity/selector	CHECK (Left or proper tank)
5. Oil Press/Temp	CHECK, GREEN
6. Breakers	IN (recheck)
7. Master Switch	ON
8. Avionics Master	ON
9. GPS/Loran/Radios *(see next page)	ON * & SET
10. Auto Pilot	OFF
11. Transponder	TO Standby
12. Propeller	FULL IN (Max RPM)
13. Mixture	FULL RICH
14. Aux Pump	ON
15. Trims	SET (Aileron neutral, Elevator Take-off)
16. Flaps Set	TAKE-OFF (15 Down)
17. Controls Free	CHECK (Proper throw and directions)



* **NOTE**: Allow enough time for your GPS/LORAN and the gyro instruments to fully stabilize/erect. A **minimum** of five (5) minutes is recommended, **eight (8) minutes if IMC conditions exist.** Do not accept a departure time within this limit.

RUNWAY CHECKS (After Cleared)- (Checklist)

1. Strobes	- ON
2. Transponder	Set to Squawk and ON ALT
3. Approach and T.O. Area	CLEAR
4. Clearance from Tower	RECEIVED and Acknowledged
5. Takeoff Runway	Clear
6. Time Off	Note & Log

[Ground Fire/Emergency - (Checklist)

1. Master Switch	*OFF*
2. Magnetos	*OFF*
3. Mixture	*CUT-OFF*
4. Fuel Boost Pump	*OFF*
5. Fuel Shut-off Valve	*OFF]*

A reminder !

TAKE-OFF & CLIMB - (Checklist)

1. Take-off Power	2700 RPM
2. Oil Temperature (Green)	120°F minimum
3. Cylinder Head Temperatures (Green)	140°F minimum
4. Check Engine Instruments	**after** Power Application
5. Check Flight Instruments	Operating
6. Rotate	65 kts (75 mph)
7. Initial Climb	90 kts (104 mph)
8. Upon Positive Climb, Landing not possible	GEAR UP

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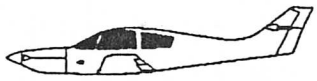


9. At ≈ 700 feet AGL	FLAPS UP
10. Reduce Power	25 inches, 2500 RPM
11. Mixture	LEAN for Climb *
12. Cylinder Head Temps (Green)	430°F Maximum
13. Oil Temperature (Green)	240°F Maximum
14. Boost Pump (Green),Verify Press.	OFF (at 1000 AGL)

* Note: These numbers are typical. Check for your specific engine and aircraft.

CRUISE - (Checklist)

1. Throttle	SET
2. Propeller	SET (Max 2500 RPM)
3. Mixture	LEAN As Req'd *
4. Fuel tanks	MONITOR, Maintain 10 Gal or greater
	30 Minutes fuel, VFR Day, 45 minutes night

- GENERAL LEANING RULES-

The following are excerpts from the Lycoming Engine Operating Handbook and are generally applicable for all engines.

A. Never exceed the maximum cylinder head temperature limits.

B. For maximum service life, CHTs should be maintained below 435°F (224°C) during high performance cruise operations and below 400°F (205°C) for economy cruise powers.

C. Maintain "Full Rich" for Take-off, climb, and cruise power settings of above 75% power. For take-off from high altitude airports, if engine roughness is noted, lean only enough to obtain smooth operation. Be alert for temperature rise. This is most likely to occur at altitudes over 5000 feet.

D. Always return to full rich **before** increasing power settings.

E. Operate the engine at maximum power mixture for performance cruise powers and at best economy mixture for economy cruise power.

F. During let-down flight operations it may be necessary to manually enrichen uncompensated carbureted or fuel injected engines to obtain smooth operation.

G. On turbocharged engines never exceed 1650°F turbine inlet temperature (TIT) with standard turbochargers.

H. Changes to cruise altitudes and/or power settings require the mixture to be reset.

NOTE

The following guidelines reflect recommended proceduires with the specified equipment. It is prudent to know each method in case of equipment failure.

LEANING, EXHAUST GAS TEMPERATURE

1. Normally aspirated engines with fuel injectors or uncompensated carburetors.

a. Maximum Power Cruise (Approx 75% power) - 150°F on rich side of peak EGT for best power. Monitor cylinder head temperatures.

b. Best Economy Cruise (Approx 75% power and below) - Operate at peak to 50° lean of peak EGT

2. Turbocharged engines (standard turbos)

a. Best Economy Cruise - Lean to peak turbine inlet temperature (TIT) or 1650°F, whichever occurs first.

b. Maximum Power Cruise - The engine must always be operated on the rich side of peak EGT or TIT for this condition. Before leaning to obtain maximum power mixture it is necessary to establish a reference point. This is accomplished as follows:

(a) Establish a peak EGT or TIT for best economy operation at the highest economy cruise power without exceeding 1650°F.

(b) Deduct 125°F from this temperature and thus establish the temperature reference point for use when operating at maximum power mixture.

(c) Return mixture control to full rich and adjust the RPM and manifold pressure for desired cruise operation.

(d) Lean out mixture until EGT or TIT is the value established in Step (b). This sets the mixture at Best Power.

LEANING, FLOWMETER

Lean to the applicable fuel-flow tables or lean to an indicator marked for correct fuel flow for each power settings.

LEANING, MANUAL MIXTURE CONTROL

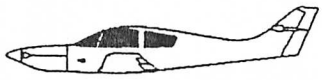
(Economy cruise, 75% power or less, without flowmeter or EGT gauge)

Carbureted Engines

1. Slowly move mixture control from "Full Rich" position towards lean position.
2. Lean until engine roughness is observed.
3. Enrich until engine runs smoothly and power is regained.

Fuel Injected Engines

1. Slowly move mixture control from "Full Rich" towards lean position
2. Continue leaning until slight loss of power is noted (this may or may not be accompanied by roughness)
3. Enrich until engine runs smoothly and power is regained



USE OF CARBURETOR HEAT / ALTERNATE AIR

Carburetor Heat

The use of carburetor heat can be required during moist air operations when ambient temperatures range from 20°F to 90°F. This is due to the absorption of heat due to fuel vaporization in the throat of the carburetor. This temperature decrease can cause the condensation of this moisture to form as ice in the intake passages and restrict airflow into the engine. The ice forms generally on the butterfly valve and is observed by a drop in manifold pressure or rpm or both.

To avoid this all installations are equipped with a system to preheat the incoming air and replace the heat lost due to vaporization. This is called carburetor heat. While the heated air melts or avoids the icing condition, it also reduces the amount of power available due to the commensurate reduction in air density, and also tends to move engine operation toward detonation range. Generally this heated air also avoids any filter in the intake system thus exposing the engine to particulates which may be present.

14

Ground operations should only confirm the operation of the Carburetor Heat system.

Take-offs should be made in the "Cold" position as during these high powers the possibility of icing is considered remote, and power is lost when using "Heat".

Climbs at 80% power and above should also be made "Cold" . Should icing be suspected due to climbs thru IMC conditions, use heat sparingly and in conjunction with leaning of the mixture only enough to obtain smooth engine operation.

(b) Deduct 125°F from this temperature and thus establish the temperature reference point for use when operating at maximum power mixture.

(c) Return mixture control to full rich and adjust the RPM and manifold pressure for desired cruise operation.

(d) Lean out mixture until EGT or TIT is the value established in Step (b). This sets the mixture at Best Power.

LEANING, FLOWMETER

Lean to the applicable fuel-flow tables or lean to an indicator marked for correct fuel flow for each power settings.

15

LEANING, MANUAL MIXTURE CONTROL

(Economy cruise, 75% power or less, without flowmeter or EGT gauge)

Carbureted Engines

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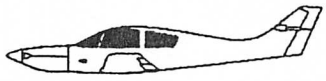


ADDITIONAL CHECKLISTS

The use of written checklists is professional, and the safest means of insuring that all items in a sequence are covered and acted on correctly. Their use is a sign of maturity and professionalism. Those provided herein are for your convenience. Modifications may be required for your particular aircrafts' configuration.

DESCENT - (Checklist)

1. Master Switch	ON
2. Mags	BOTH
3. Fuel Tank	FULLEST TANK
4. Fuel Boost Pump	ON within 1000 feet AGL
5. Altimeter	SET (for baro)
6. Mixture	Enrichen thru descent or FULL RICH
7. Power	As Req'd (Use caution, avoid rapid and excessive cooling)
8. CHTs	Maintain greater than 180°F

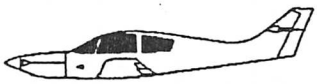
16

PRE-LANDING - (Checklist)

1. Seat Belts/Shoulder Harness	FASTENED
2. Fuel Tank (Fullest tank)	10 Gallons or more
3. Mixture	RICH
4. Flaps	1/3 Full (100 kts)
5. Propeller	HIGH RPM
6. Brakes	CHECK
7. Establish	NORMAL APPROACH
8. Aux Fuel Pump	ON (In pattern)

BALKED LANDING - (Checklist)

1. Throttle	FULL
2. Airspeed	85 kts (98 mph), Establish climb
3. Flaps	RETRACT

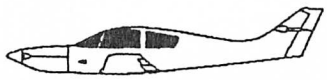


(After leaving runway)

1. Aux Fuel Pump	OFF
2. Flaps	UP
3. Strobes	OFF
4. Transponder	OFF
5. Lights	As Required
6. Trim	Reset for Take-off
7. Time	Note & Log

SHUTDOWN - (Checklist) (At parking site)

1. Radios	OFF
2. Avionics Master	OFF
3. Throttle	1000 RPM
4. Mixture	IDLE CUT-OFF
5. Mags (After engine stops rotating)	OFF
6. Lights	OFF
7. Master Switch	OFF
8. Control Lock	INSTALLED
9. Chocks/Tiedown	COMPLETE
10. Brakes	CHECK, Released



ABBREVIATED TAKE-OFF CK-LIST - (CIGAR)

Controls — FREE (of passenger interference)

Instruments

Gear Switch	DOWN
Circuit Breakers	IN
Altimeter	SET
Directional Gyro	SET
Radios	SET
Engine Instruments	IN GREEN

Gas

Shut Off	OPEN
Aux Fuel Pump	ON
Fuel Pressure	GOOD
Fuel Tanks	FULL (or adequate for flight + reserve)
Mixture	RICH

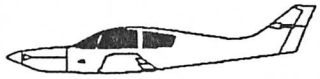
18

Attitude

Door	Latched, rechecked
Seat Belts/Harness	SET
Flaps	SET
Trim	SET
Autopilot	OFF

Run-up

Brakes	SET
Nose wheel	Straight
Mag Ck	1800 RPM, 150 max ea, 50 rpm Lt/Rt delta
Propeller	2 CYCLES
Oil Pressure	IN GREEN



ABBREVIATED LANDING CK-LIST - (GUMP)

Gas

Wing Tanks	Full
Aux Fuel Pump	ON
Fuel Pressure	GOOD

Under Carriage

Brakes	CHECKED
Flaps	SET, 1/3 @ 100 kts (115 mph)
Flaps	FULL, @ 90 kts (103 mph)

Mixture

Mixture Control	RICH

Prop

Propeller Control	HIGH RPM (In)

HEATING & VENTILATION

Cooling air. The ~~Express~~ is typically equipped with simple air intake scoops for cabin ventilation. Accordingly a simple open/closed valve is used to control air flow thru the intake scoop.

Heating. Cabin heat is generally provided by means of an intake system using engine compartment air warmed by passing over/thru a heat exchanger where exhaust gases are used as the heat source. This air-to-air heat exchanger provides air which is either dumped overboard, or into the cabin. Due to the potential of a leak from the higher pressure exhaust gases containing Carbon Monoxide (CO) into the fresh air side of this heat exchanger, it is necessary to inspect the structural integrity of the unit periodically. Initial operation of the system for the winter months should always include such an inspection. A monitoring system should be considered for the cabin air. These simple devices change color upon exposure to CO. They are quite cheap, and excellent insurance against the effects of this odorless, colorless, and deadly gas. Newer electronic sensors are also available.

COLD WEATHER OPERATIONS

PREFLIGHT INSPECTIONS

Winter preflight inspections of the aircraft need to account for the accumulation of frost or ice on the exterior of the aircraft. The Express with its extraordinary smoothness can suffer markedly from the effects of such accumulations as they utilize laminar flow airfoils. These effects result in significantly higher drag of the airframe and wings as well as reduced lift and increased weight of the accumulation. Once these deposits have been removed (preferably by warming in a hangar) the preflight should include special emphasis on freedom of control movements.

ENGINE CONSIDERATIONS

Very cold temperatures require extra considerations for engine starting and operations. The engine oil will be significantly more viscous resulting in higher oil pressures, slower indication upon starting, increased engine wear, tappet noise (if equipped with hydraulic lifters) poor battery performance, etc.

During extreme cold weather it may be necessary to preheat the engine, oil and battery before starting. Since the engines are cooled by pressurized air created in flight, ground operations must be minimized at high ambient temperatures and conducted with care at all times. Liquid cooled engine coolant must be checked each preflight and each fall for quality. A slightly slower warm-up can be expected.

NOTE

Full throttle operation must be limited to three (3) minutes, or less if cylinder head temperatures should exceed the maximum of 475°F (246°C).

Engine operations should be into the wind when possible. The mixture should be RICH. Avoid prolonged idling and do not exceed 2200 rpm on the ground. Warm up should be at 1000-1200 rpm.

The engine is warm enough for take-off when the throttle can be opened without faltering. Take-off with a turbocharged engine should not be started if indicated lubricating oil pressure, due to cold temperatures is above maximum. Excessive oil pressure can cause overboost and consequent engine damage.

CRUISE OPERATION

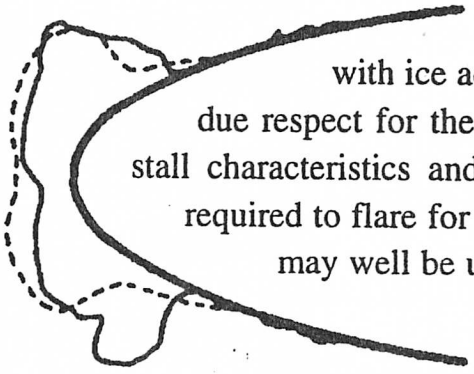
Cold weather cruise operation may require an occasional cycle of the propeller control. This could be particularly true after long duration cruise just prior to descent where lack of governor control could cause overspeeding. During descents and landing, give special attention to cylinder head temperatures, since the engine will easily over cool.

ICING CONDITIONS

Flight in icing conditions is prohibited.

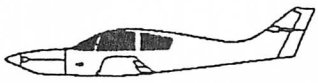
21

Should ice be inadvertently encountered it can be expected that drag will increase, possibly markedly, stall speeds will increase, again possibly significantly, and extreme care must be exercised while ice is present on the airframe.



It is prudent to avoid icing conditions if at all possible. Landings with ice accumulations should be made with due respect for the potentially significant changes in stall characteristics and speeds. The horizontal tail is required to flare for landings, and if it is contaminated may well be unable to accomplish its task especially at low airspeeds.

The ice shapes left, both calculated (dotted line) and experimental are from NASA's Icing tunnel. You are the experimenter every time you fly into a cloud at ambient temperatures suitable for icing. The message - **Always have a way out!** Know where you can go **IF....**



How fast can it build up on your Express ? The shapes, below, show 8 minutes of accretion in typical icing conditions in temperatures of -26° C on the left to 0° C on the right. There is little comfort in "knowing" that its too cold to freeze. No one has told the clouds.

-26° -18° -8° 0°

NOISE

All approaches and departures should be made with noise considerations second only to safety. More and more areas are becoming noise sensitive and our consideration of such areas will prolong our ability to operate in a friendly community environment. It is preferable to avoid rather than overfly such areas. Where necessary to overfly, do so at reduced power if prudent and overfly at 2000 feet AGL or higher.

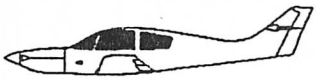
22

NOTE

The above suggestions are recommended where they do not conflict with weather conditions, ATC clearances or instructions, or where in the judgment of the pilot, they can be complied with safely.

No flyover noise level has been established for Express press aircraft, as defined by FAR 36 requirements, nor has the FAA determined that the noise level of these airplanes is considered acceptable or unacceptable for operations into or out of any airport.

Cabin noise, while quiter than many, or even most light aircraft is still worthy of action by the pilot. Good headsets or even noise canceling units should be considered for those who will spend more than an occasional few hours in the aircraft. High noise levels over time will cause hearing loss. Headsets are also desirable from a communications standpoint. Passengers can then enjoy stereo!



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24