TO STUDY AT HOME
ORIGINAL BOOK IS INSIDE AIRPLANE

QUICK REFERENCE HANDBOOK

PIPER
TWIN COMANCHE
PA 30

19 May. 08

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PREAMBLE AND USE OF THIS QUICK REFERENCE HANDBOOK (QRH)

1 **Boxed action items in bold print that follow a RED headline should be completed from memory (read often to stay fresh).**

2 Once at a safe altitude and once/if you have time, review and confirm the boxed action items in bold print have been completed.

3 After reviewing the boxed action items, carry out all additional listed action items below the box. READ EVERYTHING.

4 Action items that follow a **Yellow** headline are not memory action items and should be carried out using the QRH as a DO list/checklist. DO NOT HURRY. READ THE COMPLETE LIST!

5 Each section index identifies those subjects with memory items as **BOLD FACED** with an asterisk (*) following.

6 On the reverse of each tabbed SECTION INDEX is the MASTER INDEX, corresponding to the numbered tabs. In an emergency, it is only necessary to open to any tabbed page and read the effective section.

7 The END box signifies the end of actions for that event. END

DISCLAIMER

- **This QRH has been produced by the International Comanche Society in cooperation with the Comanche Flyer Foundation (CFF).**
- **It is intended to help promote the safe operation of the Piper Twin Comanche.**
- **The contents of this QRH will not replace the owners manual, nor is there any intent to contradict the manufacturer, or your Aviation Authorities rules and regulations, or that of your appropriately certificated Flight Instructor.**

AIRPLANE GENERAL Section 1

Emergency Airspeeds (Gross Wt)

All airspeeds quoted in this section are indicated (IAS) at sea level, std. day, and assume zero instrument error. Speeds are the same for aircraft with Tip Tanks and Gross Weight of 3725 lbs.

One-Engine-Inoperative Best Rate of Climb (Vyse) **(Reducing by approx 1 mph/1000' DA)**	**105 mph**
One-Engine-Inoperative Best Angle of Climb (Vxse) **(Increasing by approx ½ mph/1000' DA)**	**94 mph**
Two Engine Best Rate of Climb (Vy) **(Reducing by approx 4 mph/4000' DA)**	**112 mph**
Two Engine Best Angle of Climb (Vx) **(Increasing by approx 1.5 mph/4000' DA)**	**90 mph**
Minimum Control Speed, Air (Vmca)	**90 mph**
Maximum Maneuvering Speed (Va) **(Reducing to 142 mph at 2800 lbs)**	**162 mph**
Maximum Range Glide	**110 mph**
Maximum Structural Cruising (top of Green)	**194 mph**
Never Exceed Speed (Vne)	**230 mph**

Both Engines Out Glide

1	**Landing Gear**	**UP**
2	**Flaps**	**UP**
3	**Propellers**	**FEATHERED**
4	**Airspeed**	**110 mph**

If unintentional dual engine failure, and time/conditions allow:

5 **Engines** — ***Engine Restart In Flight (Pg 2-12)***

END

CABIN DOOR OPEN

1	**Fly the plane**	**It will be noisy!**
2	**All Occupants**	**SEAT BELTS ON**
3	**Secure**	**loose paper and objects**

4 **If open during, or just after take off, consider immediate return without trying to shut door. If in cruise consider landing at nearest suitable airport.**

If in-flight attempt to close is desired (difficult at best)

- Speed — less than 100 mph
- Cabin Vents — CLOSED
- Storm Window — OPEN
- Slip aircraft facing door into wind
- Get right seat passenger to try to close door
- If by yourself maintain a safe altitude, engage autopilot then try to close door.
- May not be possible to close

If door is open for landing

- Expect light buffeting thru stabilator
- Use slightly higher approach speeds (+ 5 mph)
- Close door normally on ground

END

Inadvertent Spins

Intentional spins are prohibited. If an unintentional spin is encountered perform the following procedure immediately.

1	Throttles	CLOSE
2	Ailerons*	NEUTRAL
3	Rudder	FULL OPPOSITE TO DIRECTION OF ROTATION
4	Control Wheel	BRISKLY FULL FORWARD
5	Rudder	NEUTRAL WHEN ROTATION STOPS
6	Control Wheel	SMOOTHLY BACK TO REGAIN LEVEL FLIGHT

If buffeting is felt during recovery, relax the back pressure slightly.

***NOTE:**
Application of the ailerons opposite to the direction of rotation can expedite spin recovery of the Twin Comanche

END

Emergency Descent

1	Seat Belts	SECURE
2	Throttles	CLOSE
3	Propeller Levers	FULL FORWARD
4	Landing Gear (IAS below 150 mph)	DOWN
5	Airspeed	MAINTAIN 150 MPH

NOTE: If conditions dictate, rolling the aircraft to a 40-45° bank spiral will substantially increase rate of descent. Be careful not to become disoriented and be sure to control speed accurately. Consider the extremely high rate of descent and terrain elevation, initiate recovery prior to 2000 AGL.

END

High Speed Emergency Descent

1	Seat Belts	SECURE
2	Throttles	CLOSE
3	Propeller Levers	FULL FORWARD
4	Airspeed	MAINTAIN 194 MPH (TOP OF GREEN ARC)

NOTE: If conditions dictate, rolling the aircraft to a 30° bank spiral will substantially increase rate of descent. Be careful not to become disoriented and be sure to control speed accurately. Consider the extremely high rate of descent and terrain elevation, initiate recovery prior to 2000 AGL. This is primarily a smooth air procedure.

END

ENGINES AND PROPELLERS Section 2

Engine Failure On Take Off Below Vyse

1	**Throttles**	**CLOSE**
2	**Land Ahead**	**DO NOT ATTEMPT TO TURN BACK**

If landing has been made off airfield:

3	Fuel Selectors	OFF
4	Braking	MAXIMUM
5	Mixture	CUTOFF
6	Master Switch	OFF
7	Aircraft	EVACUATE

END

Engine Failure On Take Off Above Vyse, Gear Up/Flaps up or In Transit.

1	**Airspeed**	**MINIMUM 105 MPH**
2	**Power (Mixtures/Props/Throttles)**	**FULL FORWARD**
3	**Gear**	**UP**
4	**Flaps**	**UP**
5	**Identify Failed Engine**	**DEAD LEG – DEAD ENGINE**
6	**Verify Failed Engine**	**CLOSE THROTTLE**
7	**Propeller Failed Engine**	**FEATHER**
8	**Ailerons**	**RAISE DEAD ENGINE 2-3°**
9	**Rudder**	**½ BALL TOWARDS GOOD ENGINE**

Safe Guard Good Engine

10	Power	SET 25" / 2500 RPM OR AS REQD
11	Mixture	AS REQD
12	Cowl Flaps	AS REQD
13	Temperatures and Pressures	MONITOR

Secure Failed Engine

14	Fuel Selector	OFF
15	Fuel Pump	OFF
16	Mixture	IDLE CUT OFF
17	Alternate Air	CLOSED
18	Ignition	OFF
19	Alternator/Generator	OFF
20	Cowl Flap	CLOSED

Cont'd

General

20 Terrain	MAINTAIN CLEAR OF TERRAIN
21 ATC	NOTIFY
22 Electrical Load	MONITOR
23 Fuel	***CROSSFEED AS REQD (Page 6-4)***
24 Land	AS SOON AS PRACTICAL

END

Engine Failure Above 1000' AGL

1	Airspeed		MINIMUM 105 MPH
2	Power	(Mixtures/Props/Throttles)	FULL FORWARD
3	Gear		UP
4	Flaps		UP
5	Identify Failed Engine		DEAD LEG – DEAD ENGINE
6	Verify Failed Engine		RETARD THROTTLE
7	Fuel	Contents	CHECK
		Selector	CHANGE TO TANK WITH FUEL
		Pump	ON
		Fuel Flow	CHECK FOR FLOW
8	Mixture		ADJUST
9	Alternate Air		ON
10	Ignition		BOTH ON
	If Power Not Restored		
11	Propeller Failed Engine		FEATHER
12	Ailerons		RAISE DEAD ENGINE 2-3°
13	Rudder		½ BALL TOWARDS LIVE ENGINE

Safe Guard Good Engine

14	Power	SET 25" 2500 RPM OR AS REQD
15	Mixture	AS REQD
16	Cowl Flaps	AS REQD
17	Temperatures and Pressures	MONITOR

Cont'd (pg 2-6)

Secure Failed Engine

18	Fuel Selector	OFF
19	Fuel Pump	OFF
20	Mixture	IDLE CUT OFF
21	Alternate Air	CLOSED
22	Ignition	OFF
23	Alternator/Generator	OFF
24	Cowl Flaps	CLOSED

General

24	Terrain	MAINTAIN MSA
25	ATC	NOTIFY
26	Electrical Load	MONITOR
27	Fuel	***CROSSFEED AS REQD (Page 6-4)***
28	Land	AS SOON AS PRACTICAL

END

Engine Fire During Start

Affected Engine:

1	**Starter**	**CONTINUE CRANKING**
2	**Fuel Valve**	**OFF**
3	**Throttle**	**OPEN**
4	**Electric Fuel Pump**	**OFF**
5	**Mixture**	**CUTOFF**
6	**If Fire Continues**	**CALL FOR HELP** **EVACUATE AIRCRAFT**

END

Engine Fire During Flight

1	**Power (Good Engine)**	**MAXIMUM OR AS REQUIRED**
2	**Airspeed**	**NOT BELOW 105**
3	**Reduce Drag**	**GEAR AND FLAPS UP**
	Affected Engine	
4	**Fuel Selector**	**OFF**
5	Throttle	CLOSED
6	Propeller	FEATHER
7	Mixture	CUTOFF
8	Electric Fuel Pump	OFF
9	Complete	***In Flight Shut Down Procedure (Page 2-10)***

IF fire persists:

10 Initiate ***High Speed Emergency Descent (Page 1-5)***

END

Engine Roughness In Flight

1	Mixture	ADJUST FOR MAXIMUM SMOOTHNESS
2	Electric Fuel Pump	ON
3	Fuel Selector	CHANGE TANKS
4	Engine Gauges	CHECK FOR ABNORMAL INDICATIONS
5	Magnetos	TRY LEFT, RIGHT, BOTH

If operation is satisfactory on one magneto, continue at reduced power and standard mixture to nearest airport.

6	Alternate Air	ON

If roughness continues

7	Consider	***In Flight Shutdown Procedure (Page 2-10)***

END

Propeller Overspeed

Failure of Propeller Governor

1	**Throttle**	**RETARD**
2	Prop Lever	MOVE TO DECREASE RPM
3	If able to control RPM	SET REQUIRED RPM
4	If unable to control RPM	SET THROTTLE TO KEEP RPM BELOW 2700 RPM
5	Consider	***In-Flight Shutdown Procedure (Page 2-10)***

END

High Cylinder Head or High Oil Temperatures

1	Cowl Flaps	OPEN
2	Mixture	ENRICHEN
3	Power	REDUCE IF NEEDED
4	Airspeed	MAINTAIN ABOVE 130 MPH IAS

If temperatures uncontrollable:

5	Land	AS SOON AS POSSIBLE
6	Consider	***In-Flight Shutdown Procedure (Page 2-10)***

END

Complete Loss Of or Low Oil Pressure

1	Oil Temp / CHT	MONITOR

If Oil Temp or CHT abnormally high:

2	Cowl Flaps	OPEN
3	Power	REDUCE IF NECESSARY
4	Altitude	MAINTAIN

If unable to control temps:

5	Consider	***In-Flight Shutdown Procedure (Page 2-10)***

NOTE:

A complete loss of oil pressure will result in the propeller feathering

If Pressure Restored or Stabilized:

6	Oil Temp / CHT	CONTINUE TO MONITOR

END

In-Flight Engine Shutdown Procedure

Prior to Shut Down

1	Airspeed	NOT BELOW BLUE LINE
2	Power (Good Engine)	MAX POWER OR AS REQUIRED
3	Drag	GEAR AND FLAPS UP

Affected Engine

4	Throttle	CLOSE
5	Mixture	IDLE CUT OFF
6	Propeller	FEATHER
7	Ailerons	RAISE DEAD ENGINE 2-3°
8	Rudder	½ BALL TOWARDS LIVE ENGINE

Safe Guard Good Engine

9	Power	SET 25" 2500 RPM OR AS REQD
10	Mixture	AS REQD
11	Cowl Flaps	AS REQD
12	Temperatures and Pressures	MONITOR

Secure Failed Engine

13	Fuel Selector	OFF
14	Fuel Pump	OFF
15	Ignition	OFF
16	Alternator/Generator	OFF
17	Cowl Flap	CLOSED

Cont'd pg (2-11)

General

17	ATC	NOTIFY
18	Electrical Load	MONITOR
19	Fuel	***CROSSFEED AS REQD (Page 6-4)***
20	Land	AS SOON AS PRACTICAL

END

Induction System Icing

Induction icing is very rare in the Comanche. The first indication of induction icing is a drop in Manifold Pressure followed by engine roughness.

1	**Alternate Air**	**FULL ON**
2	**Throttle**	**FULL OPEN**
3	**Mixture**	**ADJUST FOR SMOOTHNESS**

Once ice has cleared

4	Alternate Air	OFF
5	Throttle	NORMAL CRUISE SETTING
6	Mixture	ADJUST NORMALLY
7	Manifold Pressure Gauge	MONITOR FOR RECURRENCE

END

Engine Restart In Flight

Affected Engine

1	Fuel Selector	ON TANK CONTAINING FUEL
2	Prime	AS YOU WOULD A COLD ENGINE
3	Ignition Switches	ON
3	Mixture	RICH
4	Propeller	SET TO CRUISE RPM RANGE
5	Starter	ENGAGE UNTIL ENGINE WINDMILLS
6	Throttle	SET 10 INCHES MP

Note:

Allow engine to idle at 10" to 12" MP until engine temperatures begin to rise. Adjust power to desired cruise power after engine warms.

Alternate Engine Restart In Flight

Affected Engine

1	Fuel Selector	ON TANK CONTAINING FUEL
2	Ignition Switches	OFF
3	Mixture	IDLE / CUT OFF
4	Propeller	SET TO CRUISE RPM RANGE
5	Airspeed	135 MPH OR GREATER
6	Starter	ENGAGE UNTIL ENGINE WINDMILLS
7	Throttle	SET 10 INCHES MP
8	Ignition Switches	ALL ON
9	Mixture	ENRICHEN SLOWLY

Note:

Allow engine to idle at 10" to 12" MP until engine temperatures begin to rise. Adjust power to desired cruise power after engine warms.

END

ELECTRICAL Section 3

NOTE:
Due to the variety of generator and alternator systems that have been fitted to the aircraft, it is impossible to give in depth QRH procedures for all aircraft.

The following procedures are only a guide. You should use procedures that apply to the system in your aircraft.

Aircraft Fitted With Generators/ InterAV Alternator Conversion

Aircraft Fitted With Alternators

General

Aircraft Fitted With Generators / InterAV Alternator

Original Piper System/Conversion

Ammeter Shows Discharge

Indicates defective generator/s or regulator

1 Generator Circuit Breakers — CHECK IN
Allow 2 -5 minutes cool off period before resetting
Reset once only

2 Generator Field Switches — CHECK ON
Switch each one OFF then back ON

3 Master Switch — CHECK ON

4 Try pulling / resetting Generator CB's one at a time

5 If unable to restore charging — REDUCE ELECTRICAL LOAD TO MINIMUM
LAND AS SOON AS POSSIBLE

6 Prepare for complete loss of electrical power

If VMC maintain VMC or exit IMC conditions:

- Use hand held radio if so equipped
- Select MAIN or AUX Fuel (TIPS will not feed)
- ***Emergency Extension Procedure (Page 5-5)***
- ***No Flaps Landing (Page 8-2)***

If conditions allow, switch off Master switch to save power for arrival radio calls as well as gear and flap extension.

Note: Generators produce no charging output below 1200 RPM

See *Page (3-6)* for approximate current draw for various electrical items

END

Battery Overcharge

Ammeter Showing Excessive Rate of Charge
A high rate is normal for the first few minutes of flight; an excessive rate after several minutes indicates a faulty battery or voltage regulator.

1	Generator CB's	PULL INDIVIDUALLY LEAVE FAULTY CB OFF

If Fault Persists:

2	Both Generator CB's	LEAVE OFF
3	Electrical Load	REDUCE TO MINIMUM
4	Prepare for complete loss of electrical power	

- If in VMC maintain VMC or exit IMC conditions as soon as possible
- Use hand held radio if so equipped
- ***Emergency Extension Procedure (Page 5-5)***
- ***No Flaps Landing (Page 8-2)***

NOTE:
Engines may fail if operating on TIP tanks with no fuel in AUX tanks. Select MAIN/AUX Tanks for continued operation.

See Page (3-6) for approximate current draw for various electrical items

END

Aircraft Fitted With Alternators

Original Piper System

Ammeter Shows Discharge

1	Alternator "Press to Test" switches	PRESS ONE AT A TIME
2	If output of one Alternator is zero	REDUCE LOAD

If ammeter shows charge → YES → CONTINUE FLIGHT → END

NO ↓

3	Output CB of Failed Alternator	CHECK IN
4	If tripped	REDUCE LOAD TO MINIMUM RESET CB

Allow 2 -5 minutes cool off period before resetting
Reset once only

NOTE: The alternator CB's should not be opened nor should the voltage regulator switches be operated with the engine running except in an emergency.

5	Both Alternator outputs read zero	REDUCE LOAD TO MINIMUM
6	Voltage Regulator Selector Switch	SET TO AUX POSITION
7	Voltage Regulator CB's	RESET IF NECESSARY

If one or both alternators come back on line:

8	Load	RESTORE LOAD

If Output not restored:

9	Voltage Regulator Selector Switch	SET TO MAIN POSITION
10	Both Alternator CB's	OFF

Cont'd pg (3-5)

NOTE:

Engines may fail if operating on TIP tanks with no electrical power and no fuel in AUX tanks. Select MAIN/AUX tanks for continued operation.

A defective alternator will trip the system over voltage relay.

To reset Over Voltage Relay:

11 Master Switch — OFF FOR 6 SECONDS THEN BACK ON

12 Alternator CB's — RESET INDIVIDUALLY

The resetting of one of the alternators may cause over voltage relay to trip again. Note which alternator causes this to happen, this is the faulty alternator.

Reset Over Voltage Relay:

13 Master Switch — OFF FOR 6 SECONDS THEN BACK ON

14 Alternator CB — RESET CB FOR GOOD ALTERNATOR

15 If unable to restore charging — REDUCE ELECTRICAL LOAD TO MINIMUM
LAND AS SOON AS POSSIBLE

If able to restore charging, switch off Master switch to save power for arrival radio calls, gear and flap extension.

16 Prepare for complete loss of electrical power

- If VMC maintain VMC or exit IMC conditions as soon as possible
- Use hand held radio if so equipped
- ***Emergency Extension Procedure (Page 5-5)***
- ***No Flaps Landing (Page 8-2)***

See Page (3-6) for approximate current draw for electrical items

END

Electrical Loads

The following figures are for reference only and should not be relied upon as being absolute values

Landing Lights	8 AMPS PER LIGHT
Nav/Panel Lights	9 AMPS
Rotating Beacon	5 AMPS
Panel Lights	3 – 4 AMPS
Heater	2 – 3 AMPS
Avionics	10 - 15 AMPS

The transponder will draw about 8 amps on its own and is probably the highest single consumer of power in the avionics group. The COM radios have a low residual draw except when transmitting. A very well equipped panel with an EHSI etc. may consume more than the amount shown.

Auto Pilot	1 - 2 AMPS

NOTES:

The battery has a 35 ampere hour capacity. This means it can deliver (when in good condition and fully charged) 35 amps for 1 hour, or 1 amp for 35 hours, or any combination in between.

Switching off all avionics (especially the transponder) except for one radio will have a significant benefit on the batteries endurance.

Switching off both landing lights (16 amps) and the nav lights (9 amps) will greatly benefit battery endurance.

END

VACUUM SYSTEM Section 4

Left or Right Vacuum Pump Failure

1	Vacuum Gauge	MONITOR SUCTION
2	If suction below 4.5" HG	INCREASE RPM IF ABLE, DESCEND TO LOWER ALTITUDE

END

Double Vacuum Pump Failure

1	**Auto Pilot**	**DISENGAGE**
2	Attitude	AIRSPEED INDICATOR & ALTIMETER & VSI
3	Bank Angle	TURN COORDINATOR & MAG COMPASS
4	Direction	MAG COMPASS

If VMC maintain VMC or exit IMC conditions as soon as possible

5	ATC	ADVISE
6	Auto Flite or STec A/P (If Equipped)	ENGAGE

NOTE:
A double vacuum pump failure causes the autopilot to cease functioning IF the autopilot relies on inputs from vacuum powered AI and DG.

END

LANDING GEAR Section 5

Landing Gear Fails To Retract
No Amber Gear Up Light

1 Fly the plane

2 Remain above VMC

3 Gear Selector Switch — RECYCLE

4 Instrument Panel Lights — CHECK NOT ON IN DAYLIGHT

5 Circuit Breakers — CHECK

3 to check

Gear Motor CB
Gear Solenoid CB
Gear Lights CB

6 Indicator Lights — CHECK FOR BAD BULB
Swap for known good bulb

If still unable to confirm gear is up:

7 Check if gear is still down and locked — -CHECK GREEN LIGHT
-CHECK MIRROR
-RETARD THROTTLES, CHECK FOR NO GEAR HORN

If Equipped,

CHECK ALIGNMENT MARKINGS ON TORQUE TUBE

Gear Down → Yes — RETURN TO LAND

No → CARRY OUT ***EMERGENCY EXTENSION (Page 5-5)***

END

Landing Gear Fails to Extend
No Green Gear Down Light

Prior to Carrying out Emergency Extension procedure

1 Fly the Plane

2 Master Switch — CHECK ON

3 Gear Selector Switch — RECYCLE

4 Instrument Panel Lights — CHECK NOT ON IN DAYLIGHT

5 Circuit Breakers — CHECK IN
3 to check
Gear Motor CB
Gear Solenoid CB
Gear Lights CB

6 Indicator Lights — CHECK FOR BAD BULB
Swap with known good bulb

7 Mirror — CHECK TO SEE IF NOSE GEAR EXTENDED

Nose Gear Fully Extended → Yes — GEAR PROBABLY EXTENDED

↓ No or Unsure

8 Throttles — CLOSE MOMENTARILY

Amber Gear Up Light Flashes
Gear Warning Horn Sounds → No — GEAR PROBABLY EXTENDED

↓ Yes or Still Unsure

Cont'd pg (5-4)

9 Torque Tube Alignment Marks (If Installed) CHECK

Marks Aligned → Yes → GEAR IS LOCKED DOWN → END

Marks not Aligned or Still Unsure

10 Carry out ***Emergency Extension Procedure (Page 5-5)***

END

Trouble Shoot / SI - See P. 5-3, 4

Emergency Extension Procedure

NOTE: Once gear has been extended using the emergency extension procedure it cannot be retracted. Before carrying out an emergency extension, ensure that you are assured of making a landing. Full procedure is also found on inside of Emergency Gear Well Cover.

1	Speed	SLOW to 100 mph or LESS
2	Gear ***Motor*** CB	PULL
3	Gear Selector Switch	OFF or DOWN
4	Emergency Gear Extension Access Panel	REMOVE
5	Transmission Release Arm	LIFT ARM THEN PUSH FULL FORWARD

If gear does not free fall all the way down:

Note: Gear will probably free fall to down/overcenter position

6 Emergency Extension Handle — REMOVE FROM HOLDER
-PLACE IN EXPOSED SOCKET
-PUSH HANDLE FORWARD
-PLACE IN LEFT HAND SOCKET ONCE EXPOSED, IF NEEDED
-PUSH LEVER FULL FORWARD

You can expect to feel the gear "Snap" down at full forward travel as the gear mechanism goes over center.

7	Torque Tube Alignment Marks (If installed)	CHECK
8	Green Gear Down Indicator Light	GREEN
8	Mirror	CHECK NOSE GEAR EXTENDED

Note: If the emergency extension was due to electrical failure there will be no light indications.

DO NOT RE-ENGAGE GEAR TRANSMISSION IN FLIGHT

END

FUEL SYSTEM Section 6

Abnormally High Fuel Flow Indication

The standard fuel flow gauge indicates fuel flow by measuring pressure. The indicated fuel flow varies with the pressure in the system. A higher pressure shows up as a higher indicated fuel flow.

NOTES:

A higher than normal fuel flow usually indicates a plugged or partially plugged injector. This happens because overall, less fuel is flowing out of the injectors, thus raising the pressure in the system.

A plugged injector will result in a rough running engine.

A partially plugged injector can still give a smooth running engine but with a high EGT on that cylinder.

Resist the temptation to lean the mixture to normal EGT readings. The "unplugged" cylinders will be slightly richer than normal. The standard EGT gauge only samples the exhaust gasses from two cylinders. If the plugged cylinder is not one of the two cylinders that the EGT monitors there is a risk of running that cylinder too lean.

A graphic engine monitor style instrument can be use to confirm the problem.

1	Mixture	SET FOR SMOOTH RUNNING IF POSSIBLE
2	Plan	***In Flight Shutdown Procedure (Page 2-10)***
3	Land	AS SOON AS POSSIBLE

END

Abnormally Low Fuel Flow

If induction icing is not suspected, a lower than normal fuel flow usually means a split or broken fuel line; either a line to a cylinder or the line to the fuel flow gauge.

A split or broken line to a cylinder will cause rough running or at least a higher EGT on that cylinder and will give a reduced fuel flow indication. A graphic engine monitor style instrument can help confirm if a line to a cylinder has broken.

A split or broken line to the fuel flow gauge will still allow smooth engine operation. It will give a reduced fuel flow indication or no fuel flow indication at all.

There is a slight risk of fire in flight with a broken fuel line though at in flight speeds there is normally too much air flow for a fire to start.

1 Mixture — SET FOR SMOOTH RUNNING IF POSSIBLE

2 Plan — ***In Flight Shutdown Procedure (Page 2-10)***

3 Land — AS SOON AS POSSIBLE

***NOTE**: If a 2 engine landing is carried out, shut down the engine with low fuel flow as soon as practical after landing as a precaution.*

END

Engine Driven Pump Failure

Condition: Engine loses power with adequate fuel remaining in tank selected.

1	**Electric Fuel Pump**	**ON**

2 Normal Fuel Flow Restored → YES — CONTINUE, LAND AS SOON AS POSSIBLE

↓ NO

3 Proceed with ***In Flight Shutdown Procedure (Page 2-10)***

END

Crossfeed Procedure

The circular knob or arrow on the fuel selector points to the fuel source.

The LEFT selector selects the fuel source for the LEFT engine and RIGHT selector selects the fuel source for the RIGHT engine.

1	Auxiliary Fuel Pump	ON
2	Selector for engine burning X-feed fuel	SET TO CROSSFEED
3	Other selector *Both engines will feed off selected tank.*	SELECT DESIRED TANK
4	Auxiliary Fuel Pump	OFF

END

Tip Tank Fails to Feed

Conditions:

If tip tanks are selected and fuel gauge does not indicate a level change after a reasonable time or an imbalance develops, or after selecting tip tanks, one engine quits before it should . This may indicate a failed AUX/TIP fuel selector switch or solenoid.

NOTE:

TIP TANK FUEL IS UNUSABLE WITH MASTER SWITCH OFF OR AFTER A TOTAL ELECTRICAL FAILURE

If engine quits prematurely, or fuel flow erratic:

1	Auxiliary Fuel Pump	ON ASSOCIATED ENGINE
2	Fuel Selector	SET TO MAIN TANK
3	Tip tank switch	SET TO AUX
4	Tip tank switch	SET TO TIP
5	"TIP" selector light	VERIFY ON
6	Fuel Selector	ASSOCIATED ENGINE TO AUX
7	Fuel Flow	MONITOR

IF Fuel Flow stabilizes:
Monitor fuel gauge for reduced level movement. Once level reduction is verified proceed normally. → END

NOT STABLE

IF Fuel Flow remains erratic:
-Select tank with USABLE FUEL
-Assume TIP fuel is unusable
-Adjust your flight accordingly
-Beware of fuel imbalance on landing if opposite tip used → END

Cont'd. page (6-6)

If fuel gauge does not show level change after reasonable time with TIP tank selected:

8	Tip switch	SELECT AUX
9	Aux Fuel Level	NOTE LEVEL
10	Autopilot off	CHECK LATERAL TRIM

If AUX fuel level is less than expected or there is abnormal tendency to roll toward suspected full tip then consider TIP fuel unusable and adjust flight accordingly.

END

FIRE, SMOKE, FUMES Section 7

Smoke From Engine Cowls

1	Fuel Valve	OFF
2	Prop	FEATHER

3. Accomplish

In Flight Engine Shut Down Procedure (Page 2-10)

If Smoke persists

4	Accomplish	***High Speed Emergency Descent (Page 1-5)***
5	Master Switch	**OFF**

NOTE:
Engines may fail if operating on TIP tanks with no fuel in AUX tanks. If AUX low select MAIN tanks for continued operation.

6	Accomplish	***Emergency Extension Procedure (Page 5-5)***
7	Prepare for	***No Flaps Landing (Page 8-2)***

Land IMMEDIATELY.

END

Smoke or Fumes From Air Vents

Smoke or Fumes from the air vents will usually come from a heater problem. If the heater has been inactive for a while there can be some smoke the first time it is used.

Note: Heater Duct Vents are located under the panel on the side walls in Pilot and Co-Pilot foot wells. This may look like the smoke is coming from the panel.

1	**Heater Switch**	**OFF**
2	**Heater Fuel Valve**	**OFF**
3	**Vents**	**CLOSE**
4	Storm Window	OPEN
5	Once Smoke and Fumes Clear	OPEN ONE VENT

IF Smoke and Fumes still present:

6	Vent	CLOSE
7	Declare	EMERGENCY
8	Land	AS SOON AS POSSIBLE
6	Accomplish	***Emergency Descent (Page 1-5)***
7	Land	Nearest suitable airport

IF Smoke/Fumes diminished or diminishing:

8	Flight	CONTINUE NORMALLY

END

Smoke or Fumes From Under Panel

Note: Heater Duct Vents are located under the panel on the side walls in Pilot and Co-Pilot foot wells. This may look like the smoke is coming from the panel.

1	**Master Switch**	**OFF**

NOTE:
Engines may fail if operating on TIP tanks with no electrical power and no fuel in AUX tanks. If AUX tanks low, select MAIN tanks for continued operation.

2	Storm Window	OPEN
3	Electrical Equipment	ALL SWITCHES OFF
4	Once Smoke and Fumes Clear	MASTER ON
5	Watch for Smoke or Fumes	
6	If no Smoke or Fumes	SWITCH ON ELECTRICAL EQUIP ONE ITEM AT A TIME
7	Watch for Smoke and Fumes	IF DETECTED SWITCH OFF ITEM
8	If Smoke or Fumes Persist	USE FIRE EXTINGUISHER DECLARE EMERGENCY LAND AS SOON AS POSSIBLE
9	Accomplish	***Emergency Descent (Page 1-5)***
10	Master Switch	OFF
11	Plan	***Emergency Extension Procedure (Page 5-5)***
12	Plan	***No Flaps Landing (Page 8-2)***

END

LANDING Section 8

No Flaps Landing

1 Approach Speed — FLY ACCURATELY

A no flaps landing results in a higher than normal nose attitude on the approach. This leads to the pilot tending to lower the nose to the normal attitude resulting in a faster than desired approach speed.

2. Vref — INCREASE TO 95-100 MPH AT MAX GROSS

END

Single Engine Landing

On final approach when it is certain the field can be reached;

1 Landing Gear — EXTEND

2 Wing Flaps — EXTEND (PILOTS DISCRETION)

3 Airspeed — BLUE LINE UNTIL COMMITTED
THEN SPEED Vref

END

Single Engine Go-Around

1	Power (Mixture/Prop/Throttle- good engine)	FULL FWD
2	Bank towards good engine	2-3°
3	Rudder	½ BALL TOWARDS GOOD ENGINE
4	Pitch	MAINTAIN SHALLOW DESCENT / 105MPH
5	Gear	UP
6	Flaps	UP
7	Airspeed	MINIMUM 105 MPH
8	Climb	INITIATE

NOTE: This procedure is not recommended, however, it may be accomplished successfully under some conditions.

END

Power Off Landing (Both Engines Out)

1	Accomplish	***ENGINE FAILURE ABOVE 1000' AGL***
2	Glide Speed	***Page (2-5)*** 110 MPH
3	Locate	LANDING AREA
4	Plan	DESCENT and APPROACH
5	Transponder	7700
6	Radio	121.5 - BROADCAST MAYDAY CALL
7	Passengers	BRIEF

Once landing area is assured:

8	Landing Gear (Pilots Discretion)	DOWN
9	Master Switch	OFF

END

Wheels Up Landing- Unable to Extend Gear

Preparation

1	Runway	-LAND ON LONGEST, PAVED, INTO THE WIND, RUNWAY AVAILABLE
2	Fuel	BURN OFF AS MUCH AS PRACTICAL
3	Electrical	UNNECESSARY EQUIPMENT OFF
4	Landing Gear CB	PULL
5	Flaps	UP
6	Passengers	BRIEF
7	Door (Pilots Discretion)	BLOCK OPEN

Execution

8	Approach	NORMAL
9	Master Switch	OFF
10	Passengers - Brace for Landing	200' AGL
11	Touchdown	NORMAL LANDING

After Touchdown

When under control and as time permits

12	Mixtures	IDLE CUT OFF
13	Fuel Selectors	OFF
14	Occupants	EVACUATE

END

Ditching

Preparation

1	Checks	IT IS ASSUMED THAT THE "***ENGINE FAILURE ABOVE 1000' AGL***" *and* "***POWER OFF LANDING (BOTH ENGINES OUT)***" CHECKS HAVE BEEN COMPLETED
2	Glide Speed	110 MPH
3	If wind speed less than 25 knots set up to land along the top of a primary swell.	
4	If wind speed is greater than 25 knots approach into wind, aiming to touchdown on the back slope or crest of a swell.	
5	Passengers	-BRIEF -LIFE JACKETS ON

Execution

6	Flaps	UP
7	Landing Gear	UP
8	Throttles	CLOSED
9	Fuel Selectors	OFF
10	Mixtures	IDLE CUT OFF
11	Ignitions	OFF
12	Props	FEATHERED
13	Seat Belts	TIGHT
14	Door (Pilots Discretion)	BLOCK OPEN
15	Master Switch	OFF

After Touchdown

16	Occupants	EVACUATE
17	Lifejackets/Raft	INFLATE/DEPLOY

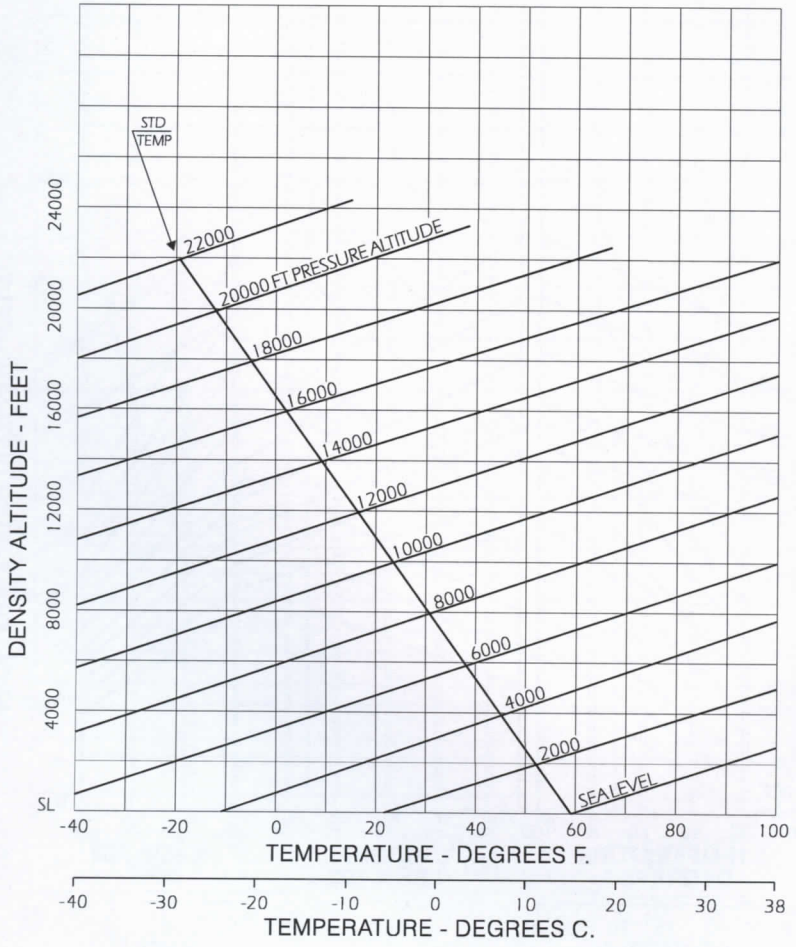
END

IN-FLIGHT PERFORMANCE Section 9

ALTITUDE CONVERSION CHART

THIS CHART SHOULD BE USED TO DETERMINE DENSITY ALTITUDE FROM EXISTING TEMPERATURE AND PRESSURE ALTITUDE CONDITIONS.

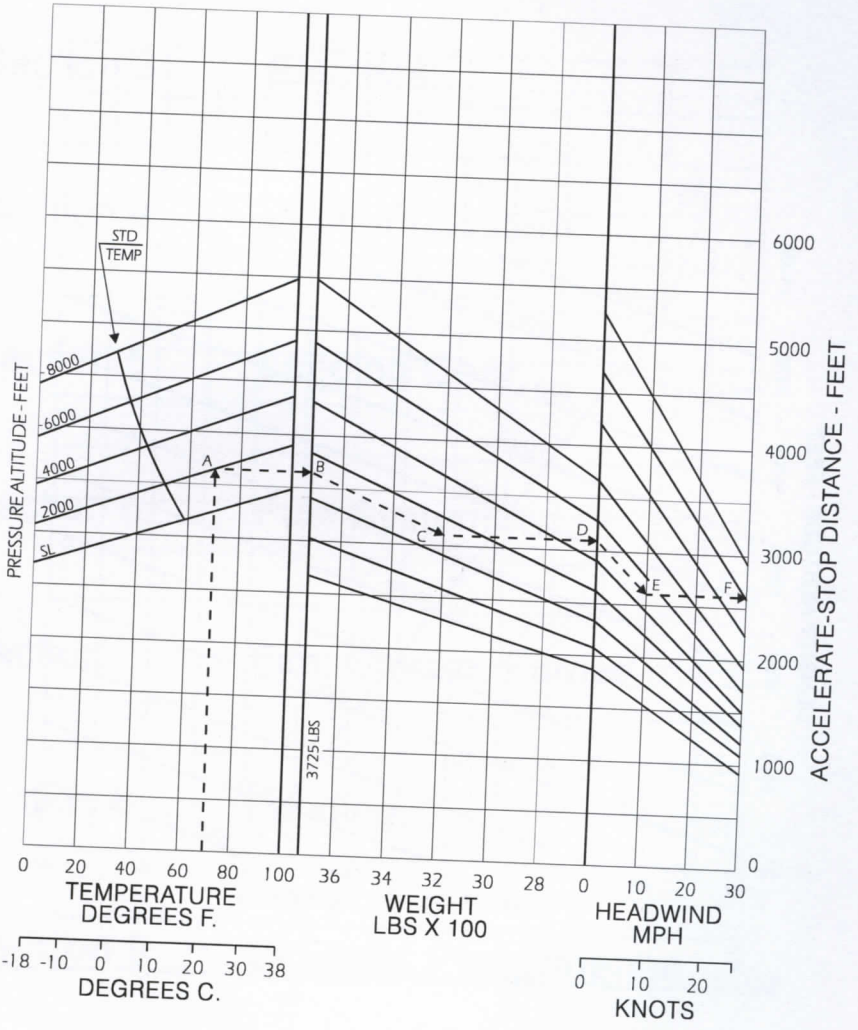
FOR USE WITH THE ACCOMPANYING PERFORMANCE CHARTS.



ACCELERATE - STOP DISTANCE

WING FLAPS RETRACTED
FULL THROTTLE AND MAX RPM
BOTH THROTTLES CLOSED AT DECISION SPEED

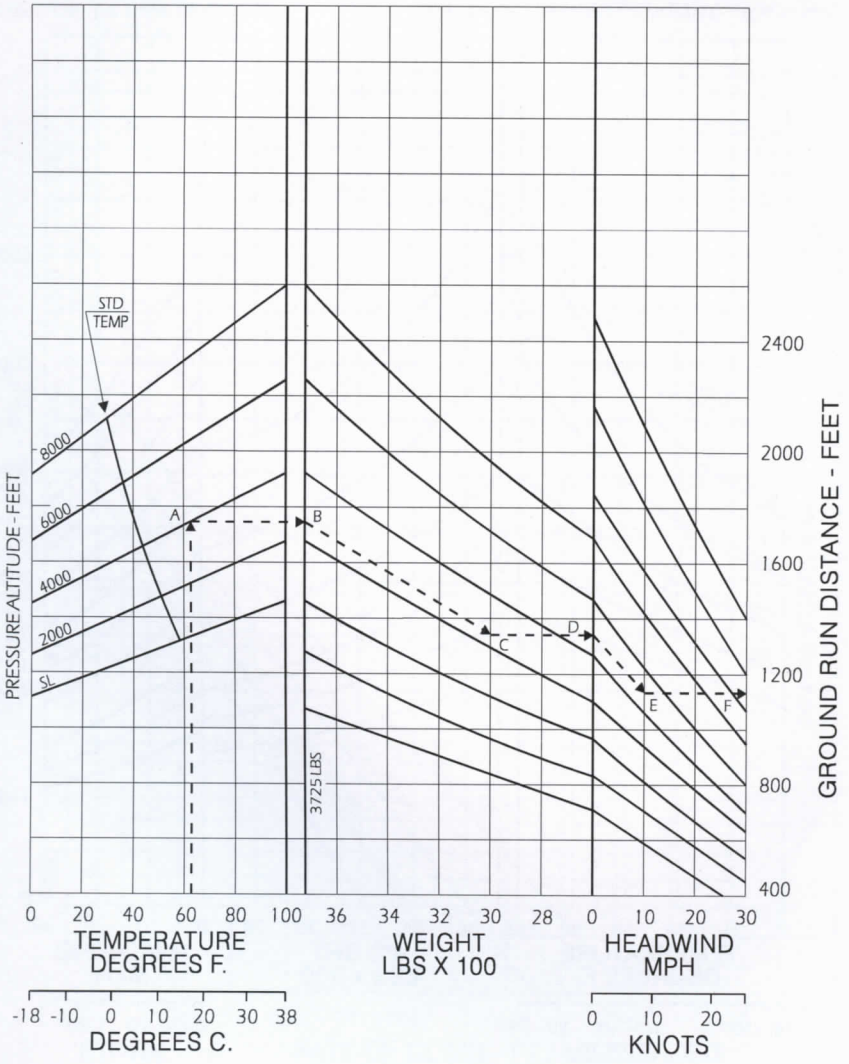
RUNWAY SURFACE: PAVED, LEVEL, DRY
ACCELERATE TO 90 MPH IAS
MAXIMUM BRAKING EFFORT



TAKEOFF GROUND RUN DISTANCE

WING FLAPS: 15 DEGREES
RUNWAY SURFACE: PAVED, LEVEL, DRY

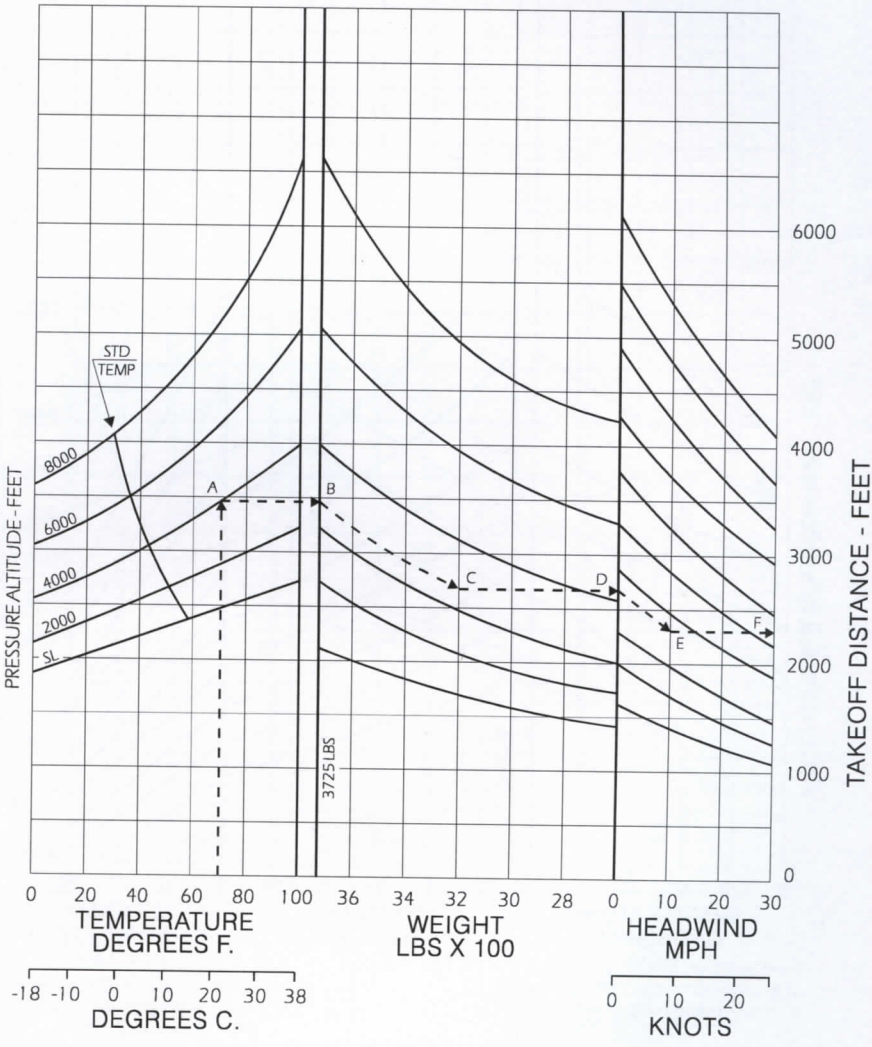
FULL THROTTLE AND MAX RPM
TAKEOFF SPEED = 80 MPH IAS



TAKEOFF DISTANCE OVER A 50 FT OBSTACLE

WING FLAPS: 15 DEGREES
RUNWAY SURFACE: PAVED, LEVEL, DRY

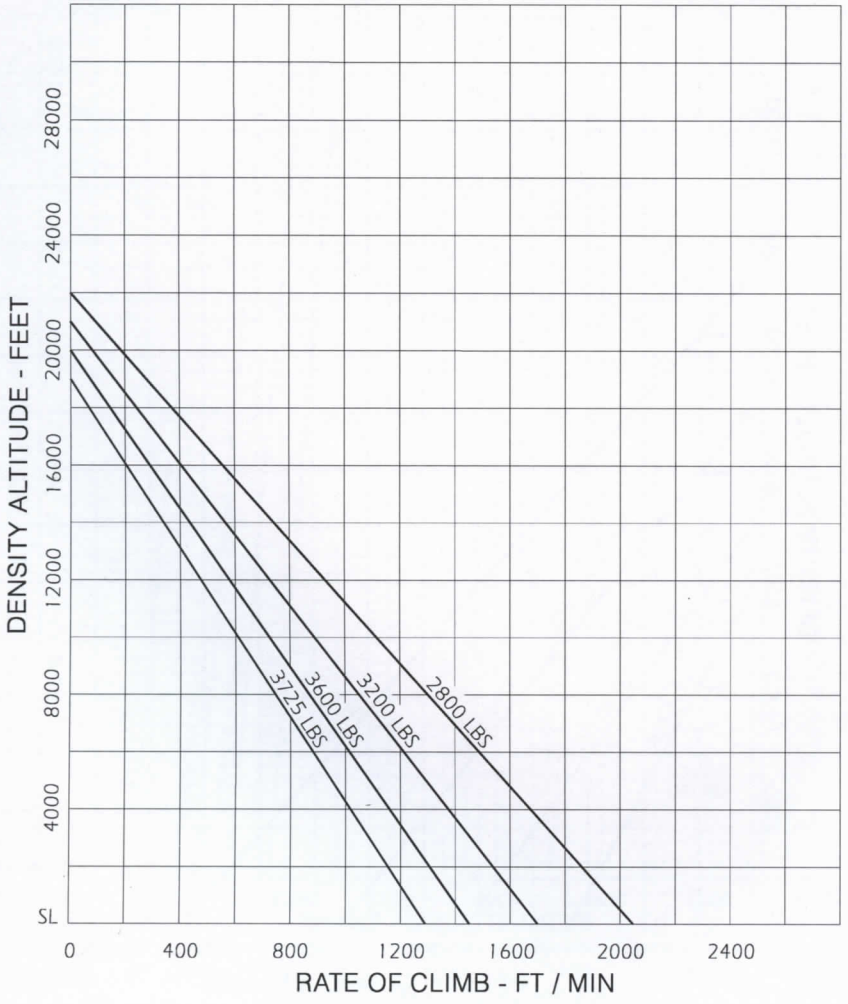
FULL THROTTLE AND MAX RPM
ATTAIN 91 MPH AT 50 FT AGL



MULTI-ENGINE RATE OF CLIMB

COWL FLAPS OPEN
FULL THROTTLE AND MAX RPM
LANDING GEAR RETRACTED

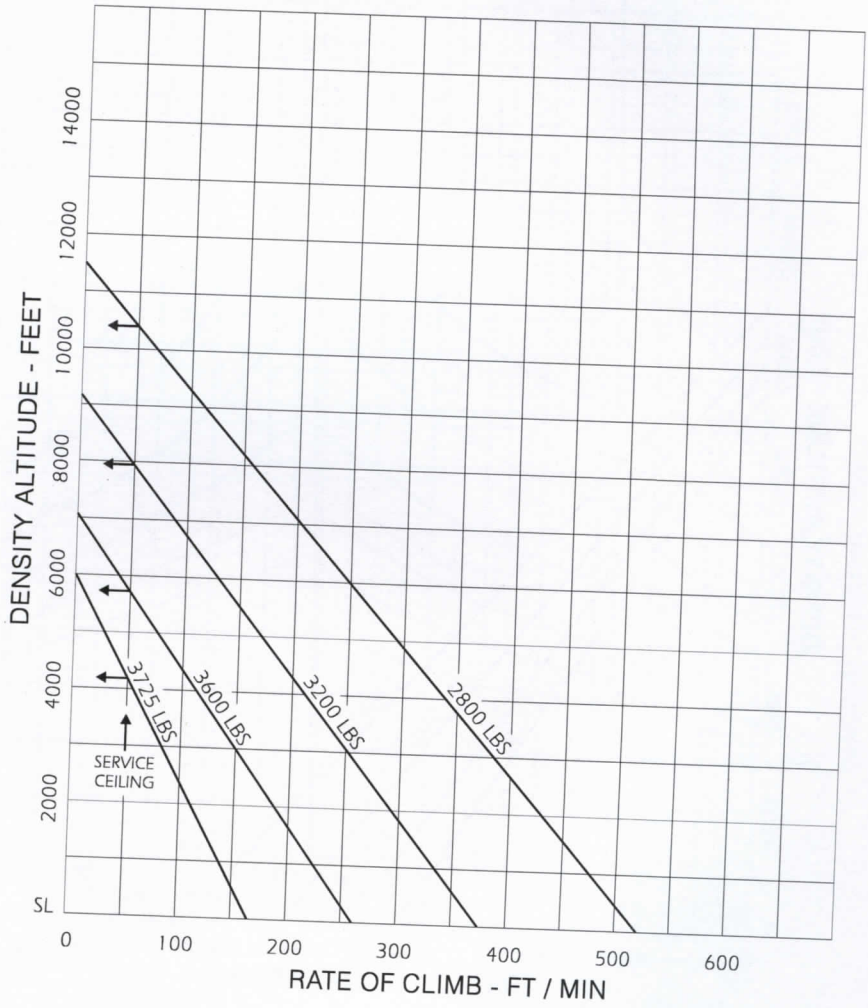
MIXTURE: ADJUST FOR SMOOTH OPERATION
OPTIMUM AIRSPEED
WING FLAPS RETRACTED



SINGLE-ENGINE RATE OF CLIMB

LEFT ENGINE: INOPERATIVE
LEFT PROPELLER: FEATHERED
RIGHT ENGINE: FULL THROTTLE
RIGHT PROPELLER: MAX RPM

MIXTURE: ADJUST FOR SMOOTH OPERATION
GEAR AND WING FLAPS RETRACTED
OPTIMUM AIRSPEED
COWL FLAPS OPEN



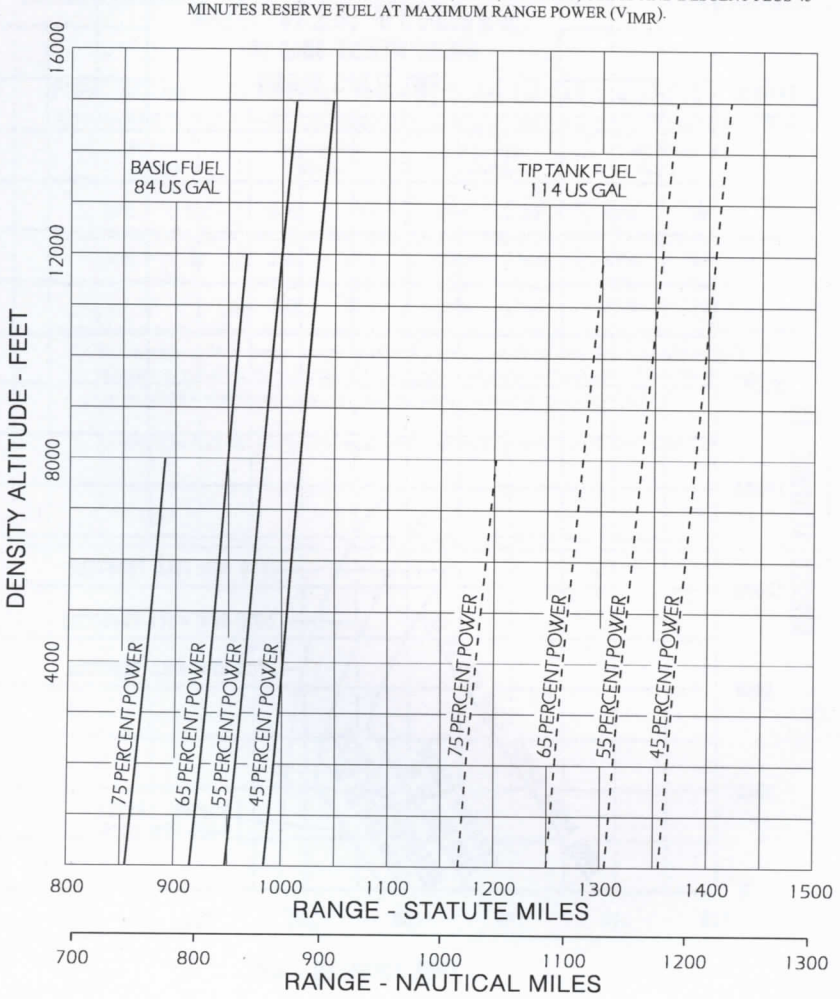
RANGE PROFILE

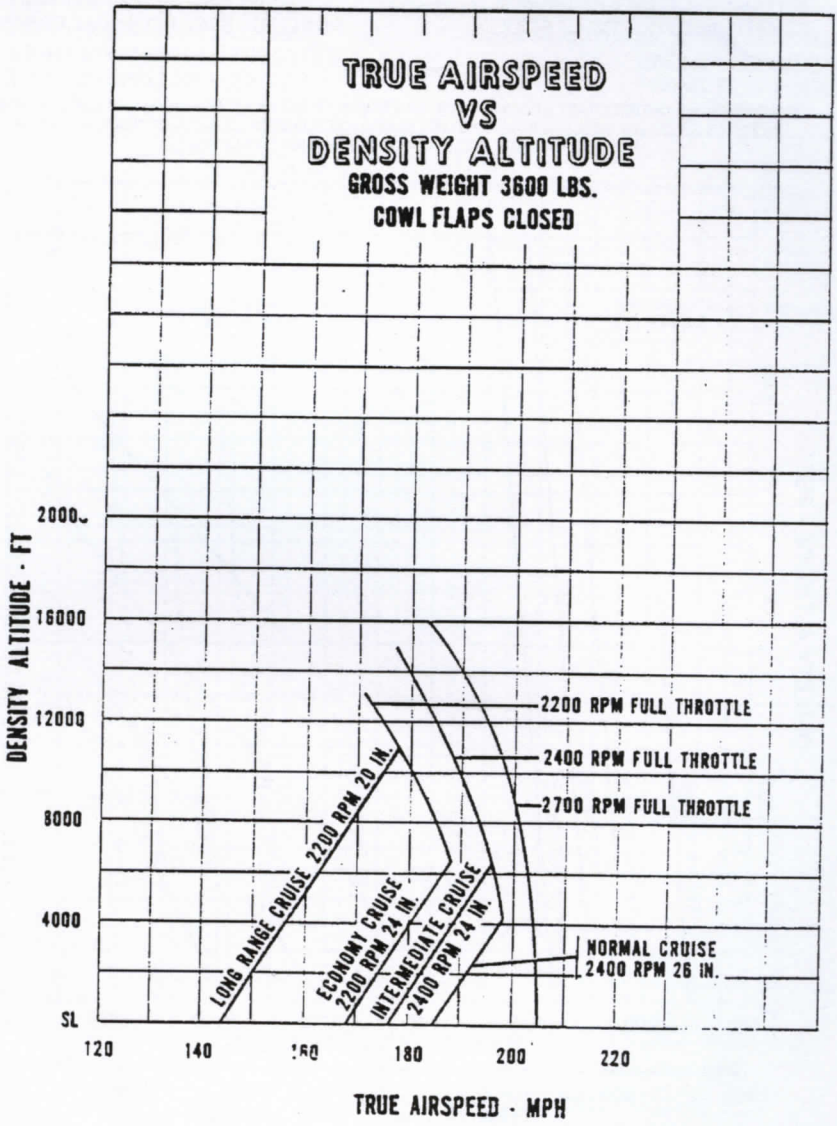
INITIAL FUEL LOAD: AS SHOWN
WEIGHT: 3600 POUNDS AT START

GEAR AND FLAPS RETRACTED
MIXTURE: BEST ECONOMY CRUISE

**** WARNING ****

FIGURES SHOWN IN THIS CHART GIVE NO CONSIDERATION TO WIND OR NAVIGATIONAL ERRORS. RANGE INCLUDES AN ALLOWANCE FOR FUEL USED IN START, TAXI, TAKEOFF, CLIMB AND DESCENT PLUS 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER (V_{IMR}).



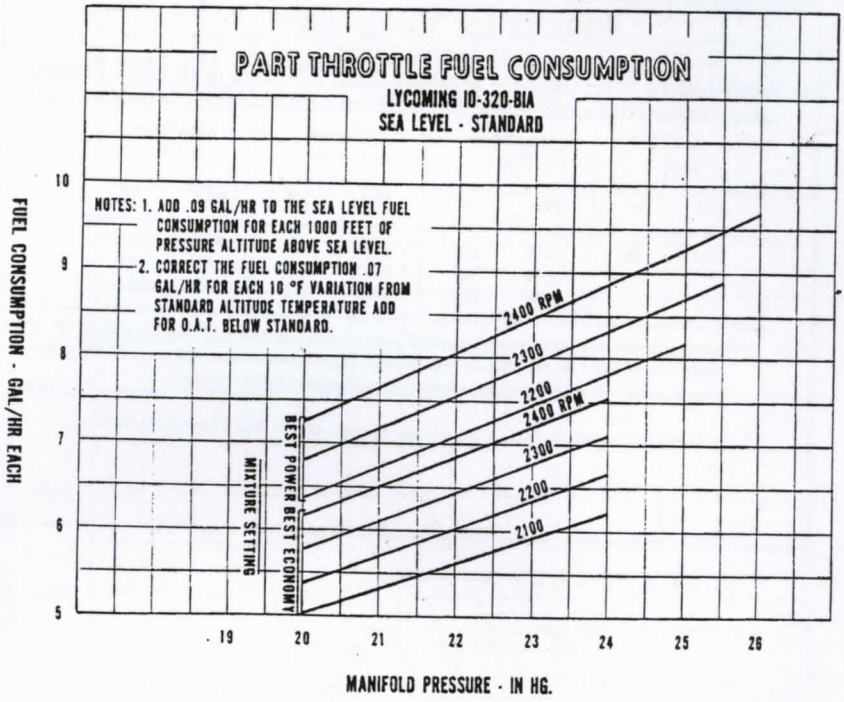

TRUE AIRSPEED
VS
DENSITY ALTITUDE
GROSS WEIGHT 3600 LBS.
COWL FLAPS CLOSED
DENSITY ALTITUDE - FT
2000
16000
12000
8000
4000
SL
120
140
160
180
200
220
TRUE AIRSPEED - MPH
2200 RPM FULL THROTTLE
2400 RPM FULL THROTTLE
2700 RPM FULL THROTTLE
LONG RANGE CRUISE 2200 RPM 20 IN.
ECONOMY CRUISE 2200 RPM 24 IN.
INTERMEDIATE CRUISE 2400 RPM 24 IN.
NORMAL CRUISE 2400 RPM 26 IN.

Power Setting Table (Cruise) - Lycoming Model L10-320-B & 10-320-B Engines

Normal Cruise		Intermediate Cruise		Economy Cruise		Long Range Cruise	
RPM	MP	RPM	MP	RPM	MP	RPM	MP
2400	26	2200	25.6	2200	24.0	2100	20.6
		2300	24.7	2300	23.2	2200	20.0
		2400	24.0	2400	22.5	2300	19.3

1. To maintain constant power, correct manifold pressure approximately 0.17" Hg. for each 10° F variation in induction air temperature from standard altitude temperature. Add manifold pressure for air temperatures above standard; subtract for temperatures below standard.

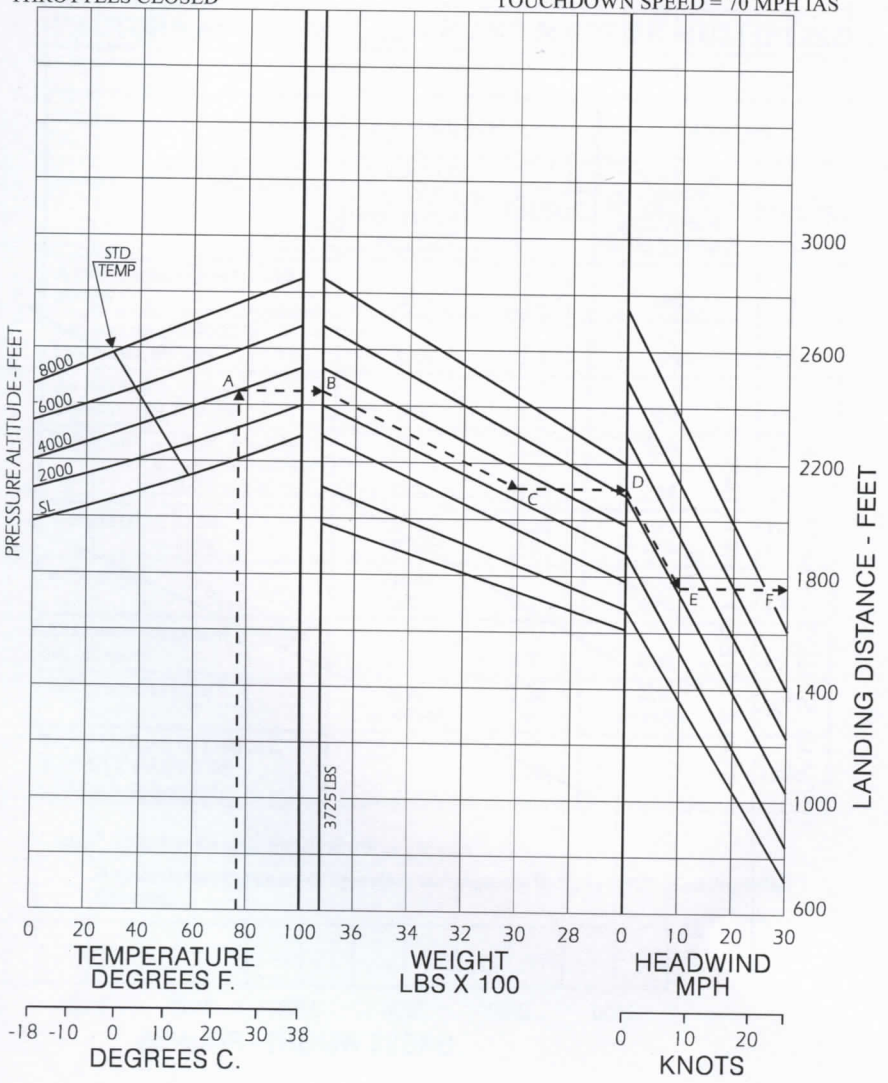
2. To determine fuel consumption for these power settings refer to Fuel Consumption Chart.


PART THROTTLE FUEL CONSUMPTION
LYCOMING IO-320-BIA
SEA LEVEL - STANDARD
NOTES: 1. ADD .09 GAL/HR TO THE SEA LEVEL FUEL CONSUMPTION FOR EACH 1000 FEET OF PRESSURE ALTITUDE ABOVE SEA LEVEL.
2. CORRECT THE FUEL CONSUMPTION .07 GAL/HR FOR EACH 10 °F VARIATION FROM STANDARD ALTITUDE TEMPERATURE ADD FOR O.A.T. BELOW STANDARD.
2400 RPM
2300
2200
2400 RPM
2300
2200
2100
BEST POWER BEST ECONOMY MIXTURE SETTING
FUEL CONSUMPTION - GAL/HR EACH
10
9
8
7
6
5
19
20
21
22
23
24
25
26
MANIFOLD PRESSURE - IN HG.

LANDING DISTANCE OVER A 50 FT OBSTACLE

WING FLAPS: 27 DEGREES
RUNWAY SURFACE: PAVED, LEVEL, DRY
THROTTLES CLOSED

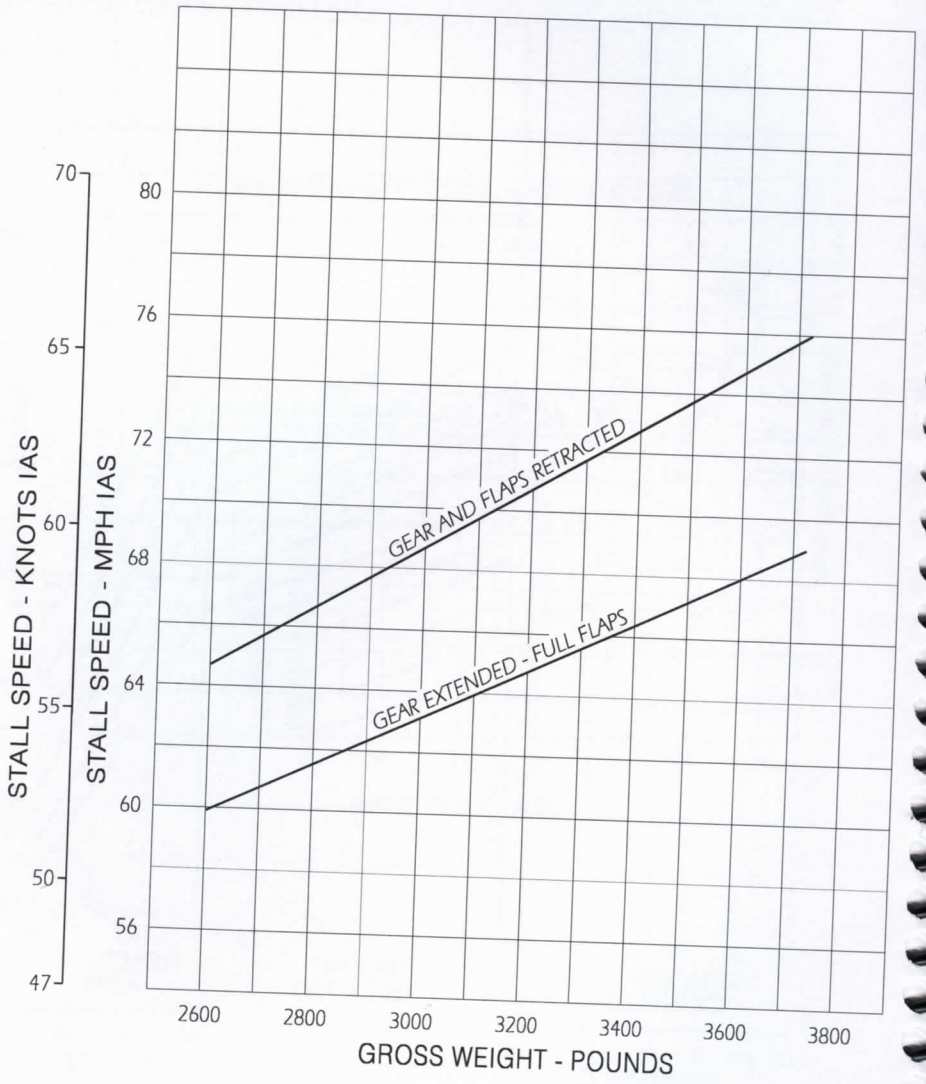
MAXIMUM BRAKING EFFORT
APPROACH SPEED = 90 MPH IAS
TOUCHDOWN SPEED = 70 MPH IAS



STALL SPEED vs. GROSS WEIGHT

STANDARD ATMOSPHERE

POWER OFF



FACTORS ARE CUMULATIVE AND MUST BE MULTIPLIED

CONDITION	TAKE-OFF		LANDING	
	INCREASE IN DISTANCE TO HEIGHT 50 FEET	FACTOR	INCREASE IN LANDING DISTANCE FROM 50 FEET	FACTOR
A 10% increase in aeroplane weight	20%	1.2	10%	1.1
An increase of 1,000ft in aerodrome altitude	10%	1.1	5%	1.05
An increase of 10 deg C in ambient temperature	10%	1.1	5%	1.05
Dry grass* – Short, 5" (13cm)	20%	1.2	20%	1.2
– Long, between 5" & 10" (13-25cm)	25%	1.25	30%	1.3
Wet grass* – Short	25%	1.25	30%	1.3
– Long	30%	1.3	40%	1.4
A 2% slope*	uphill 10%	1.1	downhill 10%	1.1
A tailwind component of 10% of lift-off speed	20%	1.2	20%	1.2
Soft ground or snow*	25% or more	1.25 +	25% or more	1.25 +
NOW USE ADDITIONAL SAFETY FACTORS (if data is unfactored)		1.33		1.43

Notes: * Effect on Ground Run/Roll will be greater.

Any deviation from normal operating techniques is likely to result in an increased distance.