Pilot's Operating Handbook and FAA Approved Airplane Flight Manual Supplement for

Tornado Alley Turbonormalizing System

When Tornado Alley Turbonormalizing System is installed in the Cirrus Design SR22 in accordance with Supplemental Type Certificate Numbers SA10588SC and SE10589SC, this Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR22 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR22 Pilot's Operating Handbook.

Tornado Alley Turbo, Inc.

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Ada, OK 74820

• Note •

Noted effectivity "*Serials before G3 Wing*" indicates Serials 1602, 1821, 1840, 1863 thru 2333, 2335 thru 2419, and 2421 thru 2437.

Noted effectivity "*Serials with G3 Wing*" indicates Serials 2334, 2420, 2438 and subsequent.

This POH Supplement Change, dated Reissue 2: May 7, 2008, supersedes and replaces Reissue 1 of this POH Supplement dated April 3, 2007. Dates of original issue and reissue are:

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MAY 07 2008

FAA Approved [signature] **Date** ________

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Section 1 - General

Engine

The airplane is powered by Teledyne Continental Motors engine model IO-550-N, fuel-injected, direct drive, air-cooled, horizontally opposed, 6-cylinder, 550 cubic inch displacement, rated at 310 horsepower. The engine has been modified by the addition of the Tornado Alley Turbonormalizing System which provides 29 inches of manifold pressure to 25,000 feet.

Propeller

Hartzell

Propeller Type.. Constant Speed, Three Blade

Model Number... PHC-J3YF-1N/N7605

Diameter...78.0” (76.5” Minimum)

Hartzell

Propeller Type.. Constant Speed, Three Blade

Model Number...PHC-J3YF-1RF/F7693DF(B)

Diameter...78.0” (75.0” Minimum)

Symbols, Abbreviations and Terminology

Engine Power Terminology

TIT **Turbine Inlet Temperature** is the temperature measured in front of the first stage turbine nozzle valves.

Section 2 - Limitations

Airspeed Limitations

The indicated airspeeds in the following table are based upon Section 5, Airspeed Calibrations, of the basic AFM using the normal static source. When using the alternate static source, allow for the airspeed calibration variations between the normal and alternate static sources.

Serials before G3 Wing			
Speed	**KIAS**	**KCAS**	**Remarks**
V_{NE} up to 17,500 feet MSL	201	204	**Never Exceed Speed** is the speed that may not be exceeded at any time.
V_{NE} at 25,000 feet MSL	171	173	V_{NE} is reduced linearly from 17,500 feet to 25,000 feet.
V_{NO} up to 17,500 feet MSL	178	180	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air and then only with caution.
V_{NO} at 25,000 feet MSL	152	153	V_{NO} is reduced linearly from 17,500 feet to 25,000 feet.

Serials with G3 Wing			
Speed	**KIAS**	**KCAS**	**Remarks**
V_{NE} up to 17,500 feet MSL	200	204	**Never Exceed Speed** is the speed that may not be exceeded at any time.
V_{NE} at 25,000 feet MSL	170	173	V_{NE} is reduced linearly from 17,500 feet to 25,000 feet.
V_{NO} up to 17,500 feet MSL	177	180	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air and then only with caution.
V_{NO} at 25,000 feet MSL	151	153	V_{NO} is reduced linearly from 17,500 feet to 25,000 feet.

Airspeed Indicator Markings

The airspeed indicator markings are based upon the basic AFM Section 5 Airspeed Calibrations using the normal static source. When using the alternate static source, allow for the airspeed calibration variations between the normal and alternate static sources.

Serials before G3 Wing		
Marking	**Value (KIAS)**	**Remarks**
White Arc	59 - 104	Full Flap Operating Range Lower limit is the most adverse stall speed in the landing configuration. Upper limit is the maximum speed permissible with flaps extended. Do not use flaps above 17,500 feet MSL.
Green Arc up to 17,500 feet MSL 25,000 feet MSL	 70 - 178 70 - 152	Normal Operating Range Lower limit is the maximum weight stall at most forward C.G. with flaps retracted. Upper limit is the maximum structural cruising speed (V_{NO}). V_{NO} and upper limit of green arc is reduced linearly from 17,500 feet to 25,000 feet.
Yellow Arc up to 17,500 MSL 25,000 feet MSL	 178 - 201 152 - 171	Caution Range Operations must be conducted with caution and only in smooth air. Upper and lower limits of yellow arc are reduced linearly from 17,500 feet to 25,000 feet.
Red Line up to 17,500 feet MSL 25,000 feet MSL	 201 171	Never exceed speed (V_{NE}) Maximum speed for all operations. V_{NE} and red line is reduced linearly from 17,500 feet to 25,000 feet.

Airspeed Indicator Markings (Cont)

Serials with G3 Wing

Marking	Value (KIAS)	Remarks
White Arc	62 - 104	Full Flap Operating Range Lower limit is the most adverse stall speed in the landing configuration. Upper limit is the maximum speed permissible with flaps extended. Do not use flaps above 17,500 feet MSL.
Green Arc up to 17,500 feet MSL 25,000 feet MSL	 73 - 177 73 - 151	Normal Operating Range Lower limit is the maximum weight stall at most forward C.G. with flaps retracted. Upper limit is the maximum structural cruising speed (V_{NO}). V_{NO} and upper limit of green arc is reduced linearly from 17,500 feet to 25,000 feet.
Yellow Arc up to 17,500 MSL 25,000 feet MSL	 177 - 200 151 - 170	Caution Range Operations must be conducted with caution and only in smooth air. Upper and lower limits of yellow arc are reduced linearly from 17,500 feet to 25,000 feet.
Red Line up to 17,500 feet MSL 25,000 feet MSL	 200 170	Never exceed speed (V_{NE}) Maximum speed for all operations. V_{NE} and red line is reduced linearly from 17,500 feet to 25,000 feet.

Power Plant Limitations

Engine

Do not reduce manifold pressure below 15 inches when above 18,000 ft MSL.

Propeller

Hartzell

Propeller Type.. Constant Speed, Three Blade

Model Number.. PHC-J3YF-1N/N7605

Diameter..78.0” (76.5” Minimum)

Hartzell

Propeller Type.. Constant Speed, Three Blade

Model Number..PHC-J3YF-1RF/F7693DF(B)

Diameter..78.0” (75.0” Minimum)

Instrument Markings

Instrument (Range)	Red Line	Green Arc	Yellow Arc	Red Line
	Minimum	Normal	Caution	Maximum
Turbocharger Inlet Temperature (TIT) (200 - 1800°F)	—	—	—	1750°F
Fuel Flow (0 – 40 U.S. Gal./Hr.)	—	10 - 36 GPH	36 - 39 GPH	39 GPH
Manifold Pressure (10 – 30 Inches Hg)	—	15.0 - 29.6 in.Hg	29.6 - 32.0 in.Hg	32.0 in.Hg

Altitude Limits

Maximum Takeoff Altitude ....10,000 Feet MSL

Maximum Operating Altitude ....25,000 Feet MSL

The operating rules (FAR Part 91 and FAR Part 135) require the use of supplemental oxygen at specified altitudes below the maximum operating altitude.

Environmental Conditions

Do not operate the airplane below an outside air temperature of -40°F (-40°C).

Systems and Equipment Limits

Flap Limitations

Do not use flaps above 17,500 feet MSL.

Placards

Instrument Panel Upper Right:

AVOID CONTINUOUS OPERATION
WITH THE SET
BETWEEN
18 GPH AND 30 GPH
WITH MP ABOVE 26" Hg.

NORMAL HIGH POWER CRUISE
2500 RPM, 29.0 - 29.5" MP
at 16 TO 17.6 GPH

⇦ Not required if annunciation is provided on integrated avionics installation.

Fuel Pump, Engine Control Panel:

LOW BOOST

FUEL PUMP

HIGH BOOST/ PRIME

SR22_FM09_2479

Section 3 - Emergency Procedures

Unexpected Loss Of Manifold Pressure

If for any reason the aircraft experiences an unexpected loss of normal manifold pressure the aircraft will typically revert to operation similar to a normally aspirated aircraft at approximately the same altitude. However, continued flight should only be conducted to the nearest suitable landing place in order to investigate the cause of the unexpected loss of normal manifold pressure. Adjust mixture so that EGTs are between 1300 and 1400 °F.

The two most likely causes of this condition are:

- A leak or rupture at an induction system coupling or a loose or failed hose clamp.

  This condition does not usually present a significant hazard and can usually be repaired promptly at most repair facilities.

- A significant leak in the exhaust system.

This condition **may present an immediate hazard** to continued safe flight, including a possible fire hazard. Because it is difficult to distinguish between an induction system leak and an exhaust system leak, all unexpected losses of normal manifold pressure should be treated as being caused by an exhaust leak until proven otherwise.

In the event of an unexpected loss of manifold pressure perform the following procedure:

1. Reduce power to the minimum power setting required for continued flight to a suitable landing.
2. Remain alert for the possibility of a fire in the engine compartment. In the event of a fire in the engine compartment, shut off the fuel at the fuel valve and follow the Cirrus emergency procedure for an in-flight fire in the AFM.
3. Descend to the minimum safe altitude from which a landing may be most safely and expeditiously accomplished.
4. Declare an emergency.

CAPS Deployment at High Altitudes

For any indicated airspeed, as altitudes increase the true air speed of the deployment increases. Higher true air speeds increase the parachute inflation loads. This makes it all the more important for the operator to take all reasonable efforts to slow to the minimum possible airspeed prior to deploying the CAPS.

Section 3A - Abnormal Procedures

Inadvertent Icing Encounter

Flight into known icing conditions is prohibited. However, If icing is inadvertently encountered:

1. Pitot Heat .... ON
2. Exit icing conditions...........................Turn back or change altitude.
3. Cabin Heat .... MAXIMUM
4. Windshield Defrost ....FULL OPEN

• Note •

Alternate induction air door will automatically open if required.

Engine Failure In Flight-retarding Power Lever To Idle

Below 18,000 Feet

Retarding the power lever to idle at or near a full rich mixture setting may cause engine combustion to cease, depending on the position of the fuel pump and altitude. At altitudes below 18,000 feet, advancing the throttle should cause resumption of normal engine operation.

Retarding the power lever to idle at or near a very lean mixture setting may cause engine combustion to cease. This is most likely to occur when the RPM falls with decreasing airspeed on landing or roll out after landing. Using the boost pump in the LOW BOOST position during approach and landing will prevent this condition.

• WARNING •

Inadvertent use of the HIGH BOOST / PRIME position of the electric Fuel Pump, with the Power Lever near or in the idle position may prevent the engine from regaining power when the Power Lever is advanced

Above 18,000 Feet

The manifold pressure should be maintained at or above 15" Hg (bottom of the green arc on the manifold pressure gage) when the aircraft is operating above 18,000 feet. If the manifold pressure is reduced below 15" Hg and the Power Lever positioned close to or at idle, the engine may cease combustion. Upon advancing the Power Lever, if the wind milling engine does not immediately regain power, the following procedure should be used:

1. Electric Fuel Pump.. LOW BOOST
2. Power Lever ....½ OPEN
3. Mixture Control ....FULL RICH, then LEAN until engine starts then slowly advance to FULL RICH
4. Power Lever .... AS REQUIRED
5. Mixture .... AS REQUIRED
6. Electric Fuel Pump.. AS REQUIRED

Section 4 - Normal Procedures

Airspeeds for Normal Operation

Enroute Climb, Flaps Up:

- Normal, Full Power, Full Rich Climb ....120 KIAS

Preflight Inspection

Perform Preflight Inspection per basic POH. Additionally, perform the following inspections:

Nose, Right and Left Sides

- Grasp the end of each tailpipe where it exits the lower cowl area and confirm each is secure. If there is any indication that the tailpipe is not fully secure, repair before further flight. Do not fly the aircraft with a loose tailpipe.

Starting Engine (add to procedure)

Electric Fuel Pump.. LOW BOOST

• Note •

If the engine is warm priming is not required. On the first start of the day, especially under cool ambient conditions, holding the Fuel Pump switch to the HIGH BOOST/PRIME position for 2 seconds will improve starting.

After engine starts:

Mixture .... LEAN

until RPM rises to a maximum value,

Leave the mixture in this position during taxi and until runup.

Before Takeoff (add to procedure)

Electric Fuel Pump.. LOW BOOST

• Caution •

Because this aircraft has a turbonormalizing system that maintains near sea level manifold pressure for all takeoffs, *The mixture should normally be full rich for takeoff, even at high elevation airports*. Leaning for takeoff and during maximum performance climb may cause excessive cylinder head temperatures.

For maximum power operations (Power Lever full forward - 2700 RPM, 29.6 in. Hg manifold pressure) fuel flow should be 35 to 36 GPH. On hot days takeoff performance will be improved slightly with the fuel flow at 34 GPH until clear of obstructions, then the fuel flow should be returned to the 35 to 36 GPH range.

Takeoff (add to procedure)

Power Check:

- Check full-throttle engine operation early in takeoff run.
- The engine should run smoothly and turn approximately 2700 RPM.
- All engine parameters should read in the green.

• Note •

MP may temporarily increase to 31 - 32 in Hg on first flight of the day due to cooler oil temperatures and associated higher oil pressures. This is acceptable under these conditions but normal full throttle should be 29.6 in. Hg. The fuel flow will normally also increase in proportion to the increase in manifold pressure. If manifold pressure exceeds 32 inches on takeoff or during full power climbs, reduce power to maintain no more than 32.0 in Hg.

As the oil temperature increases during the climb the full power manifold pressure will steadily decline to a level near the normal 29.6 inches manifold pressure value at the top of the green arc. If the engine operates above 31.0 inches for more than two minutes after takeoff, then the system needs to be readjusted. During full power climbs or high power cruise with the oil temperature above 190° F, if the manifold pressure consistently exceeds 29.6 inches, then the system should be adjusted to reduce manifold pressure under these conditions.

The electric Fuel Pump should be in the LOW BOOST position during takeoff and for climb. Leave the Fuel Pump in the LOW BOOST position for 30 minutes after leveling off after the climb to allow the temperature of the fuel in the tanks to stabilize. Above 18,000 feet, HIGH BOOST / PRIME may be required on hot days for vapor suppression.

Climb

1. Oxygen .... AS REQUIRED
2. Power Lever .... FULL FORWARD
3. Mixture .... FULL RICH
4. Airspeed.. V_y

   After reaching altitude, for noise abatement considerations

   - Below 7,500 feet... 120 KIAS
   - Above 7,500 feet .... 130 KIAS

5. Electric Fuel Pump... LOW BOOST
6. Fuel Flow .... MONITOR

   During full power climb full, rich fuel flow may slowly decline from the normal sea level range of 35 to 36 GPH down to 33 GPH. This is acceptable, but will usually be corrected by use of LOW BOOST (below 18,000 feet) or HIGH BOOST/PRIME (above 18,000 feet). If cylinder head temperatures consistently exceed 380°F, use higher airspeeds for better cooling.

7. Engine Parameters .... MONITOR

   To avoid excessive CHTs, verify electric Fuel Pump is in the LOW BOOST position. For increased engine life do not allow CHTs to continuously exceed 380°F. If any CHT consistently exceeds 380°F during the climb, lower the nose and increase airspeed as required to maintain the hottest CHT at or below 380°F whenever practical. Intermittent CHTs up to 410°F are not a concern. Maximum CHT value remains 460 °F.

Cruise Climb - Mixture Set at Lean Of Peak

Cruise climb with the mixture lever set to a lean mixture setting (LOP) is acceptable provided CHTs remain under 380°F. This climb procedure may not be possible in very hot weather, but in moderate temperature conditions, LOP cruise climbs are sometimes useful, especially at altitudes up to 18,000 feet. Depending on aircraft weight and OAT, LOP cruise climbs will result in 600 to 700 FPM rates of climb at 130-140 KIAS. Above 18,000 feet, climbs should be made at full rich mixture as described in Climb Checklist.

1. Power Lever ....FULL FORWARD
2. Mixture .... 17.0 to 17.6 GPH
3. Minimum Airspeed ....130 KIAS
4. Electric Fuel Pump... LOW BOOST

   If cylinder head temperatures consistently exceed 380°F, use higher airspeeds for better cooling, and/or make further reductions in fuel flow. If for any reasons, CHTs exceed 410°F, *climbs should be made at full rich mixture as described in Climb Checklist.*

Use of High Boost / Prime

Under some extreme environmental conditions, the use of the electric fuel pump in the HIGH BOOST / PRIME position may be required in flight above 18,000 feet to adequately suppress vapor formation. This condition is most likely to occur during climbs above 18,000 feet on hot days with warm or hot fuel in the tanks. Except for aid in starting the engine, do not use HIGH BOOST / PRIME below 18,000 feet. Above 18,000 feet, if there is a loss of fuel flow or vapor locking is suspected, turn the electric fuel pump to HIGH BOOST /PRIME POSITION and reset the mixture as required to maintain adequate stable fuel flow. Vapor locking is most often indicated by any or a combination of the following:

- Fluctuations in normal fuel flow possibly coupled with abnormal engine operation;
- Rising EGTs and TIT coupled with falling fuel flow
- Rising CHTs (late in the process)

After the aircraft is in cruise flight for 30 minutes or more, the electric fuel pump should be returned to the LOW BOOST position or OFF, as conditions permit.

During Climb, Cruise and Descent

1. Oxygen .... AS REQUIRED
   - Check masks and/or cannulas for proper flow.

Cruise Leaning

Normal cruise flight is accomplished with engine power settings between 65% and 85% power. The engine power setting and corresponding fuel consumption for various altitudes and temperatures can be determined by using the cruise performance data in Section 5.

Normal cruise power settings will be conducted with the mixture lever positioned to operate the engine with the mixture set lean of peak EGT or TIT.

Desired Cruise Setting	Configuration
Maximum Cruise Power	Power Lever - Max available MAP at 2500 RPM Mixture - 17.6 GPH* (~85% Power) High CHT below 380°F
Economy Cruise Power	Power Lever - 24" MAP at 2500 RPM Mixture - 13.0 to 14.5 GPH* (~63% to 69% Power) High CHT below 380°F

* If provided by integrated avionics, target fuel flow indicator may be used as an aid to set mixture (target fuel flow is a cyan mark on the fuel flow indicator and indicates fuel flow for ideal LOP air-fuel ratio).

• Caution •

For engine break-in, cruise at a minimum of 75% power until the engine has been operated for at least 25 hours or until oil consumption has stabilized. Operation at this higher power will ensure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders. Engines may be operated LOP at 75% to 85% power during break-in, provided the CHTs remain below 380ºF.

Avoid continuous operation with the fuel flow set between 18 GPH and 30 GPH with MAP above 26" Hg. This will cause unacceptably high CHTs. Intermittent or transient operation only is permitted in this fuel flow range at high MAP settings, and then only when all CHTs remain below 420°F (216°C)

• Note •

During colder weather, fuel flows towards the upper end of the cruise fuel flow ranges will be appropriate. If mixture set at 18.0 GPH (max allowable LOP cruise fuel flow) still creates rough running engine in cold weather conditions, reduce MAP as required to provide smooth running engine and readjust mixture as required. During hotter weather, fuel flows nearer to the middle or lower end of the cruise fuel flow ranges will be appropriate.

Position the electric Fuel Pump to the LOW BOOST position when switching from one tank to another. Failure to activate the electric Fuel Pump before transfer could result in delayed restart if the engine should quit due to fuel starvation.

Maximum Cruise Power

1. Cruise Altitude ....ESTABLISHED
2. Power Lever .... 2700 RPM
3. Mixture ....FULL RICH for 1 to 2 minutes
4. Highest CHT .... VERIFY LESS THAN 380°F
5. Power Lever ....2500 RPM at max available MAP (29.0” to 29.6")

• Note •

After initial setting of the power lever to approximately 2500 RPM, some additional MAP may be obtained by slightly increasing the power lever until the RPM increases by 10 to 20 RPM.

6. Electric Fuel Pump.. LOW BOOST
7. Mixture .... FULL RICH
   smoothly reduce fuel flow over a period of 3 to 6 seconds to approximately 16.0 to 17.6 GPH at 2500 RPM at maximum available MAP (29.0” to 29.6")

Continued on the following page.

• Note •

During fuel flow reduction, a slight deceleration of the aircraft will occur as the mixture passes from rich of peak TIT to lean of peak TIT.

8. Engine Parameters .... MONITOR

   If any CHT persistently exceeds 380° F, LEAN mixture further in 0.3 GPH increments until all CHT's are under 380°F. If, over time, all CHT's are consistently under 380° F, mixture may be increased in approximately 0.1 to 0.2 GPH increments for increased speed. During Lean of Peak cruise operation, fuel flow should not exceed 18.0 GPH under any conditions

   • Note •

   Generally, each 0.5 GPH change in fuel flow when lean of peak and near 380°F, will result in approximately a 15° F change in CHT. Increasing fuel flow will make the CHT hotter. Decreasing fuel flow will make the CHT cooler. It may take several minutes for the CHT to stabilize after a change in fuel flow.

9. Electric Fuel Pump.. AS REQUIRED

   After 30 minutes of cruise, note fuel flow, then turn electric fuel pump OFF and reset fuel flow to noted value. If fuel flow is not stable, set electric fuel pump to LOW BOOST, and reset fuel flow to noted value.

Economy Cruise Power

Set power lever and mixture to high power cruise as described above. After the engine temperatures and power are stable, further reduce power lever until the MAP is approximately 24 to 26". This should result in a fuel flow in the 13 to 14.5 GPH range. While typically not required, provided that the engine continues to operate smoothly, the mixture may be further leaned for improved economy.

Descent (add to procedure)

Power .... AS REQUIRED

- Avoid prolonged idle settings. Maintain a CHT of 240°F (116°C) or greater. Typically, no adjustment in the cruise mixture setting is required or appropriate.

Rapid Descent (add to procedure)

Power Lever ....Smoothly REDUCE MAP 17 to 20 in.Hg

Mixture ....Maintain CHTs above 240°F

Before Landing (add to procedure)

Electric Fuel Pump.. LOW BOOST

Mixture .... FULL RICH

After Landing (add to procedure)

Electric Fuel Pump.......................................OFF or LOW BOOST

Mixture .... LEAN to obtain maximum idle RPM

Shutdown (add to procedure)

Electric Fuel Pump (if used)...OFF

Section 5 - Performance

Performance of the airplane with the Tornado Alley Turbonormalizing System is equal to or better than the performance as listed in the basic AFM. Except for the following tables, refer to the basic AFM for all performance information.

• Note •

Data presented in the following tables is manufacturers data provided to enhance safe operation of the aircraft. This data is not FAA approved.

Time, Fuel and Distance to Climb

Lean of Peak Climb Technique

Conditions:

- Power.............................Full Throttle
- Mixture........ 17.0-17.6 GPH to FL180
- Full Rich (35 GPH) above FL180
  Fuel Density.....................6.0 LB/GAL
- Weight ....3400 LB
- Winds...Zero
- Climb Airspeed ....Noted

Example:

Outside Air Temp .... ISA
Weight...................................3400 LB
Airport Press..........................2000 FT
Pressure Altitude.................12000 FT

Time to Climb.................16.1 Minutes
Fuel to Climb......................4.6 Gallon
Distance to Climb..................39.1 NM

• Note •

- Monitor Cylinder Head Temperatures in LOP climb; if cylinder head temperatures consistently exceed 380ºF, use higher airspeeds for better cooling, and/or make further reductions in fuel flow. If for any reasons, CHTs exceed 410ºF, use the *Rich of Peak Cruise Climb Procedure*.

Press Alt FT	OAT (ISA) °C	Climb Speed KIAS	Time Minutes	Fuel U.S. Gal	Distance NM
Sea Level	**15**	100	0.0	0.0	0.0
1,000	**13**	130	1.4	0.4	3.1
2,000	**11**	130	2.8	0.8	6.2
3,000	**9**	130	4.3	1.2	9.5
4,000	**7**	130	5.7	1.7	12.9
5,000	**5**	130	7.2	2.1	16.4
6,000	**3**	130	8.8	2.5	20.1
7,000	**1**	130	10.4	3.0	23.9
8,000	**-1**	130	12.0	3.5	27.8
9,000	**-3**	130	13.6	3.9	31.9
10,000	**-5**	130	15.3	4.4	36.2
11,000	**-7**	130	17.1	4.9	40.7
12,000	**-9**	130	18.9	5.4	45.3
13,000	**-11**	130	20.7	6.0	50.1
14,000	**-13**	130	22.6	6.5	55.2
15,000	**-15**	130	24.5	7.1	60.5
16,000	**-17**	130	26.5	7.6	66.0
17,000	**-19**	130	28.6	8.2	71.8
18,000	**-21**	130	30.7	8.8	77.9
19,000	**-23**	130	32.2	9.7	82.2
20,000	**-25**	130	33.7	10.6	86.8
21,000	**-27**	130	35.3	11.6	91.6
22,000	**-29**	130	36.9	12.5	96.6
23,000	**-31**	130	38.6	13.5	101.9
24,000	**-33**	130	40.4	14.6	107.5
25,000	**-35**	130	42.2	15.7	113.4

Time, Fuel and Distance to Climb

Rich of Peak Climb Technique

Conditions:

- Power .... Full Throttle
- Mixture .... Full Rich (35 GPH)
  Fuel Density ....6.0 LB/GAL
- Weight ....3400 LB
- Winds ....Zero
- Climb Airspeed..........................Noted

Example:

Outside Air Temp..........................ISA
Weight .... 3400 LB
Airport Press .... 2000 FT
Pressure Altitude .... 12000 FT

Time to Climb .... 10.5 Minutes
Fuel to Climb .... 6.1 Gallon
Distance to Climb .... 24.7 NM

Press Alt FT	OAT (ISA) °C	Climb Speed KIAS	Time Minutes	Fuel U.S. Gal	Distance NM
Sea Level	**15**	100	0.0	0.0	0.0
1,000	**13**	120	0.9	0.5	1.8
2,000	**11**	120	1.8	1.1	3.7
3,000	**9**	120	2.7	1.6	5.6
4,000	**7**	120	3.6	2.2	7.5
5,000	**5**	120	4.5	2.7	9.5
6,000	**3**	120	5.5	3.2	11.5
7,000	**1**	120	6.4	3.8	13.5
8,000	**-1**	130	7.5	4.4	16.3
9,000	**-3**	130	8.6	5.1	19.1
10,000	**-5**	130	9.8	5.8	22.1
11,000	**-7**	130	11.0	6.5	25.2
12,000	**-9**	130	12.3	7.2	28.4
13,000	**-11**	130	13.5	8.0	31.7
14,000	**-13**	130	14.8	8.8	35.2
15,000	**-15**	130	16.2	9.6	38.8
16,000	**-17**	130	17.5	10.4	42.6
17,000	**-19**	130	18.9	11.2	46.6
18,000	**-21**	130	20.4	12.1	50.8
19,000	**-23**	130	21.9	12.9	55.1
20,000	**-25**	130	23.4	13.9	59.7
21,000	**-27**	130	25.0	14.8	64.5
22,000	**-29**	130	26.6	15.8	69.5
23,000	**-31**	130	28.3	16.8	74.8
24,000	**-33**	130	30.1	17.8	80.4
25,000	**-35**	130	31.9	18.9	86.3

Cruise Performance

Conditions:

- Power....................................As Noted
- Mixture..................................As Noted
- Cruise Weight........................ 3200 LB
- Winds.. Zero

Example:

Outside Air Temp.....................-9° C
Cruise Press Alt ....12000 FT
Manifold Pressure ....29.5"
Fuel Flow .... 176 GPH

% Power..................................85%
True Airspeed.................186 Knots

• Note •

- Subtract 10 Kts if nose wheel fairings removed.
- Monitor Cylinder Heat Temperatures, if any persistently exceeds 380ºF, then LEAN the mixture further in 0.3 gph increments until all CHT's are under 380ºF. As a rule of thumb, each 0.5 gph change in fuel flow when LOP, and near 380ºF, will result in approximately a 15º F change in CHT. Increasing fuel flow will make the CHT hotter. Decreasing fuel flow will make the CHT cooler. It may take several minutes for the CHTs to fully stabilize after a change in fuel flow.

2000 Feet Pressure Altitude

Manifold Pressure MAP	Engine Speed RPM	Fuel Flow GPH	Percent Power PWR	ISA - 30° C (-19° C) KTAS	ISA (11° C) KTAS	ISA + 30° C (41° C) KTAS
29.0-29.5	**2500**	17.6	85%	162	168	174
26.0-28.0	**2500**	16.0	75%	155	161	166
22.0-25.0	**2500**	14.0	65%	147	153	158

4000 Feet Pressure Altitude

Manifold Pressure MAP	Engine Speed RPM	Fuel Flow GPH	Percent Power PWR	ISA - 30° C (-23° C) KTAS	ISA (7° C) KTAS	ISA + 30° C (37° C) KTAS
29.0-29.5	**2500**	17.6	85%	165	171	177
26.0-28.0	**2500**	16.0	75%	158	164	169
22.0-25.0	**2500**	14.0	65%	150	156	161

6000 Feet Pressure Altitude

Manifold Pressure MAP	Engine Speed RPM	Fuel Flow GPH	Percent Power PWR	ISA - 30° C (-27° C) KTAS	ISA (3° C) KTAS	ISA + 30° C (33° C) KTAS
29.0-29.5	**2500**	17.6	85%	168	175	181
26.0-28.0	**2500**	16.0	75%	161	167	173
22.0-25.0	**2500**	14.0	65%	153	159	164

Cruise Performance (Cont)

8000 Feet Pressure Altitude						
Manifold Pressure **MAP**	**Engine Speed** **RPM**	**Fuel Flow** **GPH**	**Percent Power** **PWR**	**ISA - 30° C (-31° C)** **KTAS**	**ISA (-1° C)** **KTAS**	**ISA + 30° C (29° C)** **KTAS**
29.0-29.5	**2500**	17.6	85%	172	178	184
26.0-28.0	**2500**	16.0	75%	164	170	176
22.0-25.0	**2500**	14.0	65%	156	162	167

10000 Feet Pressure Altitude						
Manifold Pressure **MAP**	**Engine Speed** **RPM**	**Fuel Flow** **GPH**	**Percent Power** **PWR**	**ISA - 30° C (-35° C)** **KTAS**	**ISA (-5° C)** **KTAS**	**ISA + 30° C (25° C)** **KTAS**
29.0-29.5	**2500**	17.6	85%	175	182	188
26.0-28.0	**2500**	16.0	75%	167	174	180
22.0-25.0	**2500**	14.0	65%	159	165	171

12000 Feet Pressure Altitude						
Manifold Pressure **MAP**	**Engine Speed** **RPM**	**Fuel Flow** **GPH**	**Percent Power** **PWR**	**ISA - 30° C (-39° C)** **KTAS**	**ISA (-9° C)** **KTAS**	**ISA + 30° C (21° C)** **KTAS**
29.0-29.5	**2500**	17.6	85%	178	186	194
26.0-28.0	**2500**	16.0	75%	171	177	184
22.0-25.0	**2500**	14.0	65%	162	168	174

14000 Feet Pressure Altitude						
Manifold Pressure **MAP**	**Engine Speed** **RPM**	**Fuel Flow** **GPH**	**Percent Power** **PWR**	**ISA - 30° C (-43° C)** **KTAS**	**ISA (-13° C)** **KTAS**	**ISA + 30° C (17° C)** **KTAS**
29.0-29.5	**2500**	17.6	85%	182	189	196
26.0-28.0	**2500**	16.0	75%	174	181	187
22.0-25.0	**2500**	14.0	65%	165	172	178

16000 Feet Pressure Altitude						
Manifold Pressure **MAP**	**Engine Speed** **RPM**	**Fuel Flow** **GPH**	**Percent Power** **PWR**	**ISA - 30° C (-47° C)** **KTAS**	**ISA (-17° C)** **KTAS**	**ISA + 30° C (13° C)** **KTAS**
29.0-29.5	**2500**	17.6	85%	186	193	200
26.0-28.0	**2500**	16.0	75%	178	185	191
22.0-25.0	**2500**	14.0	65%	169	175	182

Cruise Performance (Cont)

18000 Feet Pressure Altitude						
Manifold Pressure MAP	Engine Speed RPM	Fuel Flow GPH	Percent Power PWR	ISA - 30° C (-51° C) KTAS	ISA (-21° C) KTAS	ISA + 30° C (9° C) KTAS
29.0-29.5	**2500**	17.6	85%	190	198	205
26.0-28.0	**2500**	16.0	75%	181	189	196
22.0-25.0	**2500**	14.0	65%	172	179	185

20000 Feet Pressure Altitude						
Manifold Pressure MAP	Engine Speed RPM	Fuel Flow GPH	Percent Power PWR	ISA - 30° C (-55° C) KTAS	ISA (-25° C) KTAS	ISA + 30° C (5° C) KTAS
29.0-29.5	**2500**	17.6	85%	193	201	209
29.0-29.5	**2500**	16.8	80%	189	197	204
26.0-28.0	**2500**	16.0	75%	185	192	199
22.0-25.0	**2500**	14.0	65%	175	182	189

22000 Feet Pressure Altitude						
Manifold Pressure MAP	Engine Speed RPM	Fuel Flow GPH	Percent Power PWR	ISA - 30° C (-59° C) KTAS	ISA (-29° C) KTAS	ISA + 30° C (1° C) KTAS
29.0-29.5	**2500**	17.6	85%	197	205	213
29.0-29.5	**2500**	16.8	80%	193	201	208
26.0-28.0	**2500**	16.0	75%	188	196	203
22.0-25.0	**2500**	14.0	65%	178	186	193

24000 Feet Pressure Altitude						
Manifold Pressure MAP	Engine Speed RPM	Fuel Flow GPH	Percent Power PWR	ISA - 30° C (-63° C) KTAS	ISA (-33° C) KTAS	ISA + 30° C (-3° C) KTAS
29.0-29.5	**2500**	17.6	85%	201	209	217
29.0-29.5	**2500**	16.8	80%	196	205	212
26.0-28.0	**2500**	16.0	75%	192	200	207
22.0-25.0	**2500**	14.0	65%	182	189	196

25000 Feet Pressure Altitude						
Manifold Pressure MAP	Engine Speed RPM	Fuel Flow GPH	Percent Power PWR	ISA - 30° C (-65° C) KTAS	ISA (-35° C) KTAS	ISA + 30° C (-5° C) KTAS
29.0-29.5	**2500**	17.6	85%	203	211	219
29.0-29.5	**2500**	16.8	80%	198	207	215
26.0-28.0	**2500**	16.0	75%	193	202	209
22.0-25.0	**2500**	14.0	65%	183	191	198

Range / Endurance Profile

Serials before G3 Wing

Lean of Peak Climb Technique

Conditions:

- Power .... As Noted
- Climb Technique............ Lean of Peak
- Takeoff Weight .... 3400 Lb
- Winds ....Zero
- Total Fuel........................... 81 Gallons

Example:

Cruise Pressure Alt ....22000 ft
Climb Technique ....Lean of Peak
Power...85%

Fuel to Climb .... 12.5 Gal
Cruise Fuel Flow .... 17.6 GPH
True Airspeed ....205 KTAS
Endurance .... 3.2 Hours
Range.................................... 755 NM

• Note •

- Fuel Remaining for Cruise is equal to 81.0 gallons usable, less 1.5 gallons for taxi, less climb fuel, less 10.5 gallons for 45 minutes IFR reserve fuel at 60% Power.
- This chart is applicable only if Lean of Peak climb technique is used; use Rich of Peak Range / Endurance Profile chart if Rich of Peak climb technique is used.

85% POWER (Lean of Peak Cruise Fuel Flow, LOP Climb)

Press Alt FT	Climb Fuel Gal	Fuel Remaining For Cruise Gal	Airspeed KTAS	Fuel Flow GPH	Endurance Hours	Range NM	Specific Range Nm/Gal
2,000	**0.8**	68.2	168	17.6	3.9	657	9.6
4,000	**1.7**	67.3	171	17.6	3.8	669	9.7
6,000	**2.5**	66.5	175	17.6	3.8	680	9.9
8,000	**3.5**	65.5	178	17.6	3.7	692	10.1
10,000	**4.4**	64.6	182	17.6	3.7	703	10.3
12,000	**5.4**	63.6	186	17.6	3.6	715	10.5
14,000	**6.5**	62.5	189	17.6	3.6	728	10.8
16,000	**7.6**	61.4	193	17.6	3.5	740	11.0
18,000	**8.8**	60.2	198	17.6	3.4	753	11.2
20,000	**10.6**	58.4	201	17.6	3.3	754	11.4
22,000	**12.5**	56.5	205	17.6	3.2	755	11.7
24,000	**14.6**	54.4	209	17.6	3.1	755	11.9
25,000	**15.7**	53.3	211	17.6	3.0	754	12.0

Range / Endurance Profile (Cont)

Serials before G3 Wing

Lean of Peak Climb Technique

75% POWER (Lean of Peak Cruise Fuel Flow, LOP Climb)							
Press Alt FT	Climb Fuel Gal	Fuel Remaining For Cruise Gal	Airspeed KTAS	Fuel Flow GPH	Endurance Hours	Range NM	Specific Range Nm/Gal
2,000	**0.8**	68.2	161	16.0	4.3	691	10.0
4,000	**1.7**	67.3	164	16.0	4.2	703	10.2
6,000	**2.5**	66.5	167	16.0	4.2	714	10.4
8,000	**3.5**	65.5	170	16.0	4.1	726	10.7
10,000	**4.4**	64.6	174	16.0	4.0	738	10.9
12,000	**5.4**	63.6	177	16.0	4.0	750	11.1
14,000	**6.5**	62.5	181	16.0	3.9	762	11.3
16,000	**7.6**	61.4	185	16.0	3.8	775	11.6
18,000	**8.8**	60.2	189	16.0	3.8	788	11.8
20,000	**10.6**	58.4	192	16.0	3.6	788	12.0
22,000	**12.5**	56.5	196	16.0	3.5	788	12.3
24,000	**14.6**	54.4	200	16.0	3.4	787	12.5
25,000	**15.7**	53.3	202	16.0	3.3	786	12.6

Range / Endurance Profile (Cont)

Serials before G3 Wing

Lean of Peak Climb Technique

65% POWER (Lean of Peak Cruise Fuel Flow, LOP Climb)							
Press Alt FT	Climb Fuel Gal	Fuel Remaining For Cruise Gal	Airspeed KTAS	Fuel Flow GPH	Endurance Hours	Range NM	Specific Range Nm/Gal
2,000	**0.8**	68.2	153	14.0	4.9	750	10.9
4,000	**1.7**	67.3	156	14.0	4.8	762	11.1
6,000	**2.5**	66.5	159	14.0	4.7	773	11.3
8,000	**3.5**	65.5	162	14.0	4.7	785	11.6
10,000	**4.4**	64.6	165	14.0	4.6	797	11.8
12,000	**5.4**	63.6	168	14.0	4.5	810	12.0
14,000	**6.5**	62.5	172	14.0	4.5	822	12.3
16,000	**7.6**	61.4	175	14.0	4.4	834	12.5
18,000	**8.8**	60.2	179	14.0	4.3	847	12.8
20,000	**10.6**	58.4	182	14.0	4.2	847	13.0
22,000	**12.5**	56.5	186	14.0	4.0	846	13.3
24,000	**14.6**	54.4	189	14.0	3.9	843	13.5
25,000	**15.7**	53.3	191	14.0	3.8	841	13.6

Range / Endurance Profile

Serials before G3 Wing

Rich of Peak Climb Technique

Conditions:

- Power.................................As Noted
- Climb Technique .... Rich of Peak
- Takeoff Weight.......................3400 Lb
- Winds.. Zero
- Total Fuel .... 81 Gallons

Example:

Cruise Pressure Alt............... 22000 ft
Climb Technique .... Rich of Peak
Power.. 85%

Fuel to Climb..........................15.8 Gal
Cruise Fuel Flow................ 17.6 GPH
True Airspeed..................... 205 KTAS
Endurance...........................3.0 Hours
Range ....690 NM

• Note •

- Note: Fuel Remaining for Cruise is equal to 81.0 gallons usable, less 1.5 gallons for taxi, less climb fuel, less 10.5 gallons for 45 minutes IFR reserve fuel at 60% Power.

85% POWER (Lean of Peak Cruise Fuel Flow, ROP Climb)							
Press Alt FT	**Climb Fuel Gal**	**Fuel Remaining For Cruise Gal**	**Airspeed KTAS**	**Fuel Flow GPH**	**Endurance Hours**	**Range NM**	**Specific Range Nm/Gal**
2,000	**1.1**	67.9	168	17.6	3.9	652	9.6
4,000	**2.2**	66.8	171	17.6	3.8	658	9.7
6,000	**3.2**	65.8	175	17.6	3.7	664	9.9
8,000	**4.4**	64.6	178	17.6	3.7	670	10.1
10,000	**5.8**	63.2	182	17.6	3.6	675	10.3
12,000	**7.2**	61.8	186	17.6	3.5	679	10.5
14,000	**8.8**	60.2	189	17.6	3.4	683	10.8
16,000	**10.4**	58.6	193	17.6	3.3	687	11.0
18,000	**12.1**	56.9	198	17.6	3.2	690	11.2
20,000	**13.9**	55.1	201	17.6	3.1	691	11.4
22,000	**15.8**	53.2	205	17.6	3.0	690	11.7
24,000	**17.8**	51.2	209	17.6	2.9	689	11.9
25,000	**18.9**	50.1	211	17.6	2.8	688	12.0

Range / Endurance Profile (Cont)

Serials before G3 Wing

Rich of Peak Climb Technique

75% POWER (Lean of Peak Cruise Fuel Flow, ROP Climb)							
Press Alt FT	**Climb Fuel Gal**	**Fuel Remaining For Cruise Gal**	**Airspeed KTAS**	**Fuel Flow GPH**	**Endurance Hours**	**Range NM**	**Specific Range Nm/Gal**
2,000	**1.1**	67.9	161	16.0	4.2	686	10.0
4,000	**2.2**	66.8	164	16.0	4.2	692	10.2
6,000	**3.2**	65.8	167	16.0	4.1	698	10.4
8,000	**4.4**	64.6	170	16.0	4.0	704	10.7
10,000	**5.8**	63.2	174	16.0	3.9	709	10.9
12,000	**7.2**	61.8	177	16.0	3.9	713	11.1
14,000	**8.8**	60.2	181	16.0	3.8	717	11.3
16,000	**10.4**	58.6	185	16.0	3.7	720	11.6
18,000	**12.1**	56.9	189	16.0	3.6	723	11.8
20,000	**13.9**	55.1	192	16.0	3.4	723	12.0
22,000	**15.8**	53.2	196	16.0	3.3	722	12.3
24,000	**17.8**	51.2	200	16.0	3.2	720	12.5
25,000	**18.9**	50.1	202	16.0	3.1	718	12.6

Range / Endurance Profile (Cont)

Serials before G3 Wing

Rich of Peak Climb Technique

65% POWER (Lean of Peak Cruise Fuel Flow, ROP Climb)							
Press Alt FT	**Climb Fuel Gal**	**Fuel Remaining For Cruise Gal**	**Airspeed KTAS**	**Fuel Flow GPH**	**Endurance Hours**	**Range NM**	**Specific Range Nm/Gal**
2,000	**1.1**	67.9	153	14.0	4.9	745	10.9
4,000	**2.2**	66.8	156	14.0	4.8	751	11.1
6,000	**3.2**	65.8	159	14.0	4.7	757	11.3
8,000	**4.4**	64.6	162	14.0	4.6	763	11.6
10,000	**5.8**	63.2	165	14.0	4.5	767	11.8
12,000	**7.2**	61.8	168	14.0	4.4	771	12.0
14,000	**8.8**	60.2	172	14.0	4.3	774	12.3
16,000	**10.4**	58.6	175	14.0	4.2	777	12.5
18,000	**12.1**	56.9	179	14.0	4.1	779	12.8
20,000	**13.9**	55.1	182	14.0	3.9	778	13.0
22,000	**15.8**	53.2	186	14.0	3.8	776	13.3
24,000	**17.8**	51.2	189	14.0	3.7	773	13.5
25,000	**18.9**	50.1	191	14.0	3.6	770	13.6

Range / Endurance Profile

Serials with G3 Wing

Lean of Peak Climb Technique

Conditions:

- Power .... As Noted
- Climb Technique............ Lean of Peak
- Takeoff Weight .... 3400 Lb
- Winds ....Zero
- Total Fuel........................... 92 Gallons

Example:

Cruise Pressure Alt ....22000 ft
Climb Technique ....Lean of Peak
Power...85%

Fuel to Climb .... 12.5 Gal
Cruise Fuel Flow .... 17.6 GPH
True Airspeed ....205 KTAS
Endurance .... 3.8 Hours
Range.................................... 883 NM

• Note •

- Fuel Remaining for Cruise is equal to 92.0 gallons usable, less 1.5 gallons for taxi, less climb fuel, less 10.5 gallons for 45 minutes IFR reserve fuel at 60% Power.

This chart is applicable only if Lean of Peak climb technique is used; use Rich of Peak Range / Endurance Profile chart if Rich of Peak climb technique is used.

85% POWER (Lean of Peak Cruise Fuel Flow, LOP Climb)							
Press Alt FT	Climb Fuel Gal	Fuel Remaining For Cruise Gal	Airspeed KTAS	Fuel Flow GPH	Endurance Hours	Range NM	Specific Range Nm/Gal
2,000	**0.8**	79.2	168	17.6	4.5	763	9.6
4,000	**1.7**	78.3	171	17.6	4.5	776	9.7
6,000	**2.5**	77.5	175	17.6	4.4	789	9.9
8,000	**3.5**	76.5	178	17.6	4.3	803	10.1
10,000	**4.4**	75.6	182	17.6	4.3	817	10.3
12,000	**5.4**	74.6	186	17.6	4.2	831	10.5
14,000	**6.5**	73.5	189	17.6	4.2	846	10.8
16,000	**7.6**	72.4	193	17.6	4.1	861	11.0
18,000	**8.8**	71.2	198	17.6	4.0	876	11.2
20,000	**10.6**	69.4	201	17.6	3.9	880	11.4
22,000	**12.5**	67.5	205	17.6	3.8	883	11.7
24,000	**14.6**	65.4	209	17.6	3.7	885	11.9
25,000	**15.7**	64.3	211	17.6	3.7	886	12.0

Range / Endurance Profile (Cont)

Serials with G3 Wing

Lean of Peak Climb Technique

75% POWER (Lean of Peak Cruise Fuel Flow, LOP Climb)							
Press Alt FT	Climb Fuel Gal	Fuel Remaining For Cruise Gal	Airspeed KTAS	Fuel Flow GPH	Endurance Hours	Range NM	Specific Range Nm/Gal
2,000	**0.8**	79.2	161	16.0	4.9	802	10.0
4,000	**1.7**	78.3	164	16.0	4.9	815	10.2
6,000	**2.5**	77.5	167	16.0	4.8	829	10.4
8,000	**3.5**	76.5	170	16.0	4.8	843	10.7
10,000	**4.4**	75.6	174	16.0	4.7	857	10.9
12,000	**5.4**	74.6	177	16.0	4.7	872	11.1
14,000	**6.5**	73.5	181	16.0	4.6	887	11.3
16,000	**7.6**	72.4	185	16.0	4.5	902	11.6
18,000	**8.8**	71.2	189	16.0	4.4	917	11.8
20,000	**10.6**	69.4	192	16.0	4.3	921	12.0
22,000	**12.5**	67.5	196	16.0	4.2	923	12.3
24,000	**14.6**	65.4	200	16.0	4.1	925	12.5
25,000	**15.7**	64.3	202	16.0	4.0	925	12.6

Range / Endurance Profile (Cont)

Serials with G3 Wing

Lean of Peak Climb Technique

65% POWER (Lean of Peak Cruise Fuel Flow, LOP Climb)							
Press Alt FT	Climb Fuel Gal	Fuel Remaining For Cruise Gal	Airspeed KTAS	Fuel Flow GPH	Endurance Hours	Range NM	Specific Range Nm/Gal
2,000	**0.8**	79.2	153	14.0	5.7	870	10.9
4,000	**1.7**	78.3	156	14.0	5.6	884	11.1
6,000	**2.5**	77.5	159	14.0	5.5	898	11.3
8,000	**3.5**	76.5	162	14.0	5.5	913	11.6
10,000	**4.4**	75.6	165	14.0	5.4	927	11.8
12,000	**5.4**	74.6	168	14.0	5.3	942	12.0
14,000	**6.5**	73.5	172	14.0	5.2	957	12.3
16,000	**7.6**	72.4	175	14.0	5.2	972	12.5
18,000	**8.8**	71.2	179	14.0	5.1	988	12.8
20,000	**10.6**	69.4	182	14.0	5.0	990	13.0
22,000	**12.5**	67.5	186	14.0	4.8	992	13.3
24,000	**14.6**	65.4	189	14.0	4.7	992	13.5
25,000	**15.7**	64.3	191	14.0	4.6	992	13.6

Range / Endurance Profile

Serials with G3 Wing

Rich of Peak Climb Technique

Conditions:

- Power....................................As Noted
- Climb Technique .... Rich of Peak
- Takeoff Weight ....3400 Lb
- Winds... Zero
- Total Fuel .... 92 Gallons

Example:

Cruise Pressure Alt............... 22000 ft
Climb Technique .... Rich of Peak
Power 85%

Fuel to Climb.........................15.8 Gal
Cruise Fuel Flow .... 17.6 GPH
True Airspeed..................... 205 KTAS
Endurance...........................3.7 Hours
Range ....819 NM

• Note •

Note:Fuel Remaining for Cruise is equal to 92.0 gallons usable, less 1.5 gallons for taxi, less climb fuel, less 10.5 gallons for 45 minutes IFR reserve fuel at 60% Power.

85% POWER **(Lean of Peak Cruise Fuel Flow, ROP Climb)**

Press Alt FT	Climb Fuel Gal	Fuel Remaining For Cruise Gal	Airspeed KTAS	Fuel Flow GPH	Endurance Hours	Range NM	Specific Range Nm/Gal
2,000	1.1	78.9	168	17.6	4.5	758	9.6
4,000	2.2	77.8	171	17.6	4.4	765	9.7
6,000	3.2	76.8	175	17.6	4.4	774	9.9
8,000	4.4	75.6	178	17.6	4.3	781	10.1
10,000	5.8	74.2	182	17.6	4.2	789	10.3
12,000	7.2	72.8	186	17.6	4.1	795	10.5
14,000	8.8	71.2	189	17.6	4.0	802	10.8
16,000	10.4	69.6	193	17.6	4.0	808	11.0
18,000	12.1	67.9	198	17.6	3.9	813	11.2
20,000	13.9	66.1	201	17.6	3.8	816	11.4
22,000	15.8	64.2	205	17.6	3.7	819	11.7
24,000	17.8	62.2	209	17.6	3.5	820	11.9
25,000	18.9	61.1	211	17.6	3.5	820	12.0

Range / Endurance Profile (Cont)

Serials with G3 Wing

Rich of Peak Climb Technique

75% POWER (Lean of Peak Cruise Fuel Flow, ROP Climb)							
Press Alt FT	**Climb Fuel Gal**	**Fuel Remaining For Cruise Gal**	**Airspeed KTAS**	**Fuel Flow GPH**	**Endurance Hours**	**Range NM**	**Specific Range Nm/Gal**
2,000	1.1	78.9	161	16.0	4.9	797	10.0
4,000	2.2	77.8	164	16.0	4.9	805	10.2
6,000	3.2	76.8	167	16.0	4.8	813	10.4
8,000	4.4	75.6	170	16.0	4.7	821	10.7
10,000	5.8	74.2	174	16.0	4.6	828	10.9
12,000	7.2	72.8	177	16.0	4.5	835	11.1
14,000	8.8	71.2	181	16.0	4.5	841	11.3
16,000	10.4	69.6	185	16.0	4.4	847	11.6
18,000	12.1	67.9	189	16.0	4.2	852	11.8
20,000	13.9	66.1	192	16.0	4.1	855	12.0
22,000	15.8	64.2	196	16.0	4.0	857	12.3
24,000	17.8	62.2	200	16.0	3.9	857	12.5
25,000	18.9	61.1	202	16.0	3.8	857	12.6

Range / Endurance Profile (Cont)

Serials with G3 Wing

Rich of Peak Climb Technique

65% POWER (Lean of Peak Cruise Fuel Flow, ROP Climb)							
Press Alt FT	Climb Fuel Gal	Fuel Remaining For Cruise Gal	Airspeed KTAS	Fuel Flow GPH	Endurance Hours	Range NM	Specific Range Nm/Gal
2,000	1.1	78.9	153	14.0	5.6	865	10.9
4,000	2.2	77.8	156	14.0	5.6	873	11.1
6,000	3.2	76.8	159	14.0	5.5	882	11.3
8,000	4.4	75.6	162	14.0	5.4	890	11.6
10,000	5.8	74.2	165	14.0	5.3	897	11.8
12,000	7.2	72.8	168	14.0	5.2	903	12.0
14,000	8.8	71.2	172	14.0	5.1	909	12.3
16,000	10.4	69.6	175	14.0	5.0	915	12.5
18,000	12.1	67.9	179	14.0	4.9	919	12.8
20,000	13.9	66.1	182	14.0	4.7	921	13.0
22,000	15.8	64.2	186	14.0	4.6	922	13.3
24,000	17.8	62.2	189	14.0	4.4	921	13.5
25,000	18.9	61.1	191	14.0	4.4	921	13.6

Section 6 - Weight and Balance

See basic POH, Section 6 - Weight and Balance for list of equipment.

Section 7 - System Description

Turbonormalizing System

The Tornado Alley Turbonormalizing System utilizes two Kelly Aerospace (Formerly Garrett) turbochargers with a Kelly absolute manifold pressure controller, and a Kelly pressure relief valve. The turbochargers are new generation turbochargers designed to provide the same boost as older design turbochargers but with lower compressor discharge temperatures. This increase in efficiency is due to the improved design of the compressor blades and compressor housing. However, to further reduce engine induction temperatures, two side baffle mounted intercoolers are also installed in the system.

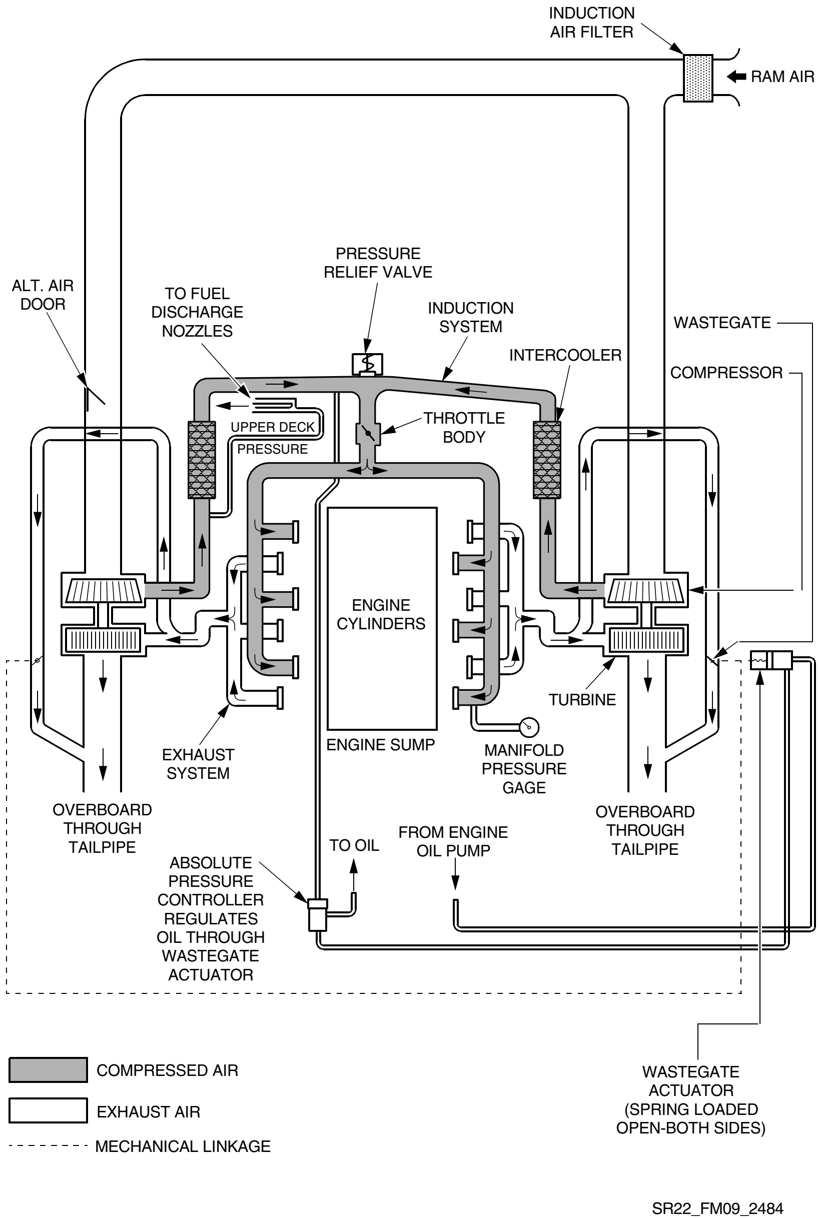
The absolute controller and wastegates work in conjunction with each other to provide proper boost pressure to the engine. The wastegate is actuated using engine oil pressure to actuate a small hydraulic cylinder which redirects the engine by-pass exhaust flow around the turbochargers. The absolute pressure controller utilizes an aneroid bellows and spring connected to a valve that regulates the amount of oil flowing out of the wastegate actuator hydraulic control cylinder. The aneroid bellows are located inside a housing that is connected to the output air produced by the compressors.

As compressor outlet pressure increases, the bellows are forced down, opening the normally closed oil control valve. When open, the valve allows metered oil to bypass the wastegate which, in turn, is spring loaded to the open position. Oil passing through the absolute controller is returned to the engine oil sump. The left hand wastegate is a master wastegate connected to a slave wastegate on the right side of the engine. The right hand wastegate is the same as the left hand wastegate, but is slaved to the hydraulic actuator on the left hand wastegate. The two wastegates are mechanically synchronized and move in parallel with each other.

Each wastegate incorporates a typical butterfly exhaust bypass valve. It is operated by a hydraulic actuator utilizing engine oil for operation. The wastegate is spring loaded to the open position. Increasing oil pressure from the engine causes the actuator to work against the spring to close the butterfly valve. The wastegate is located in the exhaust system ahead of the turbocharger turbine. As the butterfly valve opens, it allows exhaust gasses to bypass the turbocharger turbine, thereby controlling the speed and output of the turbocharger. The wastegate helps provide even control of the turbocharger speed and output so that the engine can maintain sea level manifold pressure well into the flight levels.

As turbocharger compressor outlet pressure rises, the aneroid bellows in the absolute pressure controller senses the increase in pressure. When at high engine speed and load and the proper absolute pressure is reached, the force on the aneroid bellows opens the normally closed metering valve. When the oil pressure in the waste gate actuator cylinder is lowered sufficiently, the waste gate actuator spring forces the mechanical linkage to open the waste gates. A portion of the exhaust gases then bypasses the turbocharger turbines, thus preventing further increase of turbocharger speed and holding the compressor outlet absolute pressure to the desired value. Conversely, at engine idle, the turbocharger runs slowly with low compressor pressure output; therefore, the low pressure applied to the aneroid bellows is not sufficient to affect the unseating of the normally closed metering valve. Consequently, engine oil pressure keeps the waste gates closed and all of the exhaust flows through the turbocharger turbine sections.

The system is equipped with a magnet latched ALTERNATE AIR DOOR on the left side of the induction system. When any restriction of the air filter is encountered, such as from ice or ice crystal formation, this door will open automatically. The MFD and PFD will provide a message alerting the pilot that the door is open. The door provides an alternate path for warm air from the lower side of the engine compartment to go to both turbochargers when the air filter becomes blocked. After the air filter blockage is removed, the alternate air door may be closed by simply retarding the power lever momentarily and the door will re-latch automatically. In some instances, if there is an unusual surge in engine power, especially at high altitude, the alternate air door may become unlatched. In that event, again, simply retarding the throttle momentarily will re-latch the alternate air door.


INDUCTION
AIR FILTER
RAM AIR
PRESSURE
RELIEF VALVE
ALT. AIR
DOOR
TO FUEL
DISCHARGE
NOZZLES
INDUCTION
SYSTEM
WASTEGATE
INTERCOOLER
COMPRESSOR
THROTTLE
BODY
UPPER DECK
PRESSURE
ENGINE
CYLINDERS
TURBINE
EXHAUST
SYSTEM
ENGINE SUMP
MANIFOLD
PRESSURE
GAGE
OVERBOARD
THROUGH
TAILPIPE
OVERBOARD
THROUGH
TAILPIPE
TO OIL
FROM ENGINE
OIL PUMP
ABSOLUTE
PRESSURE
CONTROLLER
REGULATES
OIL THROUGH
WASTEGATE
ACTUATOR
COMPRESSED AIR
EXHAUST AIR
MECHANICAL LINKAGE
WASTEGATE
ACTUATOR
(SPRING LOADED
OPEN-BOTH SIDES)
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