

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number SA4732NM

This certificate, issued to Merlyn Products, Inc.

MPI SN: 1822031857
AIRCRAFT RECORDS Copy for:
REG: N8105J
SN: 28R-8031005

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 3 of the Civil Air Regulations, dated 5/15/56 with Amendments, Equivalent Safety Finding, and portions FAR 23 as listed in the Type Certificate.

Original Product — Type Certificate Number: 2A13

Make: Piper

Model: PA-28R-201T, PA-28RT-201T and PA-28-201T

Description of Type Design Change: Install Continental engine Models TSI0-360-F and -FB as modified by Supplemental Type Certificate (STC) No. SE4731NM.

Limitations and Conditions: Approval of this change in type design applies to the above model aircraft only. This approval should not be extended to aircraft of this model on which other previously approved modifications are incorporated unless it is determined that the relationship between this change and any of those other previously approved modifications, including changes in type design, will introduce no adverse effect upon the airworthiness of that aircraft. A copy of this Certificate must be maintained as part of the permanent records for the modified aircraft.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the

Federal Aviation Administration.

Date of application: January 16, 1989

Date of issuance: May 12, 1989

Date issued:

Date amended:

By direction of the Administrator

Alvin R. Halbestad
(Signature)

Acting Assistant Manager, Seattle
Aircraft Certification Office

(Title)



Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.
This certificate may be transferred in accordance with FAR 21.47.

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number SE4731NM

This certificate, issued to Merlyn Products.

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified herein meets the airworthiness requirements of Part 33 of the Federal Air Regulations, dated 2/1/65 as Amended by 33-1.

Original Product — Type Certificate Number: E9CE

Make: Teledyne Continental Motors

Model: TS10-360-E, -EB, -F, -FB, -G, -GB, -LB, & -KB
LTS10-360-E, -EB, & -KB

Description of Type Design Change: Replace the fixed wastegate with a turbocharger differential pressure control system in accordance with Merlyn Products, Inc. Installation Report No. 18-1, Revision B, dated March 17, 1989, and Drawing List No. TDL 18-1, Revision B, dated March 17, 1989, or Drawing List 21-TDL-1, dated January 15, 1990, or Drawing List 20-TDL-1, dated December 30, 1989, or later FAA approved revision.

Limitations and Conditions: Approval of this change in type design applies to the above model engines only. This approval should not be extended to other engines of this model on which other previously approved modifications are incorporated unless it is determined that the relationship between this change and any of those other previously approved modifications, including changes in type design, will introduce no adverse effect upon the airworthiness of that engine. A copy of this Certificate and the Continuation Sheet must be maintained as part of the permanent records for the modified engine. (cont.)

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: January 16, 1989

Date issued: May 9, 1990

Date of issuance: May 12, 1989

Date amended: August 16, 1989; April 6, 1990, April 23, 1990

By direction of the Administrator



Stewart R. Mullen
Assistant Manager, Seattle -
Aircraft Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate
(Continuation Sheet)

Number SE4731NM

MPI SN: 1822031857
AIRCRAFT RECORDS Copy for:
REG: N8105J
SN: 28R-8031005

LIMITATIONS & CONDITIONS: (continued)

Engine Model: TS10/LTS10-360-KB

Engine Limits: Take Off, 5 minutes, 2800 RPM
Maximum Continuous, 2600 RPM
Maximum RPM above 15,000 Ft Altitude, 2600 RPM

- END -

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.



REFERENCE

Invoice: 9566
SO: SO8742 / JI4293
MPi Kit(s): 1822031857
UDP SN: 1822031857A4138
REG: N8105J
A/C Serial Number: 28R-8031005

Model: PA28RT-201T
Top Assy: 18-1001-503 A4142

The above referenced aircraft is given consent by Merlyn Products, Inc. to install the Merlyn Products, Inc. STC'd kit(s) referenced above. One copy of the following STC and Installation documents are provided for the mechanic and aircraft owner to use in the installation of the MPi kits. These documents are for use with this aircraft serial number - kit serial number only.

Installation or removal for installation in another aircraft requires that notification and request for permission to install be sent to Merlyn Products, Inc.

<u>STC</u>	<u>Report</u>
SA4732NM	MPi 18-1 Installation Instruction, REV J,
SE4731NM	MPi 18-1 Installation on TCM TSIO360-F, and -FB engines on the Piper PA28R201T, PA28RT-201T, PA28-201T

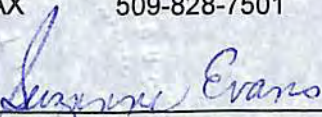
With regard to the documents please note:

Merlyn Products, Inc. FAA Approved part(s) and documents are included with the product(s) referenced herein. The recipient, by acceptance of this product & document(s), agrees that neither receipt nor possession of the product and/or documents confers or transfers any right in, or license to use, the subject matter or any design or technical information shown herein, nor any right to reproduce or disclose this document or reproduce the parts without the written permission of Merlyn Products, Inc.

If you have any questions, call Suzanne Evans at Merlyn Products, Inc.

Telephone: 509-838-7500

FAX 509-828-7501


Suzanne Evans
Merlyn Products, Inc.

Dated: 02 SEP 2022



Merlyn Products, Inc.
7500 West Park Drive
Spokane Washington 99224
Phone: 509-838-7500
Facsimile: 509-838-7501

MPI SN: 1822031857
AIRCRAFT RECORDS Copy for:
REG: N8105J
SN: 28R-8031005

**UPPER DECK PRESSURE CONTROL
FOR THE
TELEDYNE CONTINENTAL TSIO-360
MODELS -F and -FB**

INSTALLATION REPORT

NUMBER 18-1

August 3, 1989

All Revisions to this Document
Must be FAA Approved

LOG OF REVISIONS

Date	Description	Revision
08/03/89	Initial Release	N/C
02/17/89	Change adds modified fittings as MPi PN. Updates parts list. Adds Sections 8.0 and 9.0. Pages affected ii, 4, 5, 9, and adds 10, 11, and 12.	A
03/17/89	Delete use of 90-1002-501 fitting. Adds AN823-4 fitting. Pages affected i, 4, and 9	B
09/18/89	Change corrects hardware requirements, heat exchanger clearance (page 7, Figure 1), and heat shield attachment procedure.	C
07/01/90	Add recommendation for inspection of aircraft exhaust by-pass elbow and optional use of steel braided flex hose & associated hardware. Adds the optional use of Mag Pressurization Clamp Assy. Change torque value. Pages affected: i, 2, 3, 5, 6, 8 & 11	D
04/01/91	Changes per DCR 242 Clarify instructions, make use of flex lines primary and hard lines optional. Correct kit list. Renumber pages. Pages affected: i, ii, and 3 through 13 (There is no page 13 with this revision)	E
11/01/92	Revise document according to DCR 10011 to update EBE/UDP setup, and changes to Continued Airworthiness, which give preference to setup at the factory. Remove references to hard lines which are no longer used. Pages affected i, 2, 3, 5, 7, 11 and 13.	F
02/24/93	Note items that MPi performs, i.e., setup on exhaust bypass elbow ; clarify hardware usage; add 1 AN960-716L to hardware list. Pages affected: i, 2, 5, 7, 8, 11. REF: DCR 010023	G
08/15/94	Change 98-1002-4 gasket to 98-1002-7 gasket, change torque value to accommodate new gasket. Better material., Update format and title headings to new format , change to format only.	H
11-09-00	Updated cover page. Updated part numbers to correspond with top drawing list. Deleted notes which referred to procedures referencing old gasket. Addition of ground run up procedure: Pages affected: cover, 5,6, and 8.	I
8-10-2010	Removed old Sections 2.3 and 4.1 through 4.3.1 to ensure that these steps are done at MPi only and not done in the field. Added Section 4.1 for the installation of the 18-1001-503 Wastegate Assembly. Replaced 18-1000 drawing with Figure 1 and added figures 2, 3 and 4. Corrected typographical errors. Updated section and page numbers as needed for these changes.	J

MPI SN: 1822031857
 AIRCRAFT RECORDS Copy for:
 REG: N8105J
 SN: 28R-8031005

1.0 INTRODUCTION

The objective of the MPi Upper Deck Pressure Control is to provide an economical turbocharger control that minimizes compressor discharge pressure for part throttle operation. The reduction in compressor discharge pressure in turn represents a corresponding decrease in engine operation temperatures and, to a lesser degree, an increase in efficiency. By reducing overall temperatures and pressures, the reliability of the turbocharger and engine components will be enhanced and a broader operation range will be available.

In general, the installation task is associated with installing the control and providing the appropriate plumbing for its operation. The installation of the MPi system has been detailed to reduce the required time as much as possible. Basically, there are three distinct areas relative to the actual installation and one for return to service. Should any questions arise, please contact MPi.



2.0 ITEMS TO BE REMOVED

IF YOU HAVE ANY QUESTIONS OR IF A PROBLEM DEVELOPS DURING INSTALLATION OR OPERATION, CALL MPI.

(EXAMINE FIGURES BEFORE PROCEEDING)

- 2.1 Remove the upper cowling.
- 2.2 Remove the lower cowling on aircraft with intercooler installations.
- 2.3 Remove the exhaust pipe clamp from the turbocharger turbine housing. This clamp will be used later. Remove the exhaust pipe and heat exchanger assembly. Remove the exhaust bypass elbow from the tail pipe.
 - 2.3.1 If the bypass elbow is going to be re-used with the Merlyn control, ship the exhaust bypass elbow, intact to Merlyn Products, Inc. It is necessary that the exhaust bypass elbow be removed from the tailpipe in order to achieve the proper torque during set up. Occasionally, the EBE cannot be removed from the tailpipe. If this occurs, send the tailpipe/EBE to MPI for removal and setup.
- 2.4 Remove the compression nut and fitting from the number six injector reference line on the left side of the throttle body adjacent to the idle set screw. (This is necessary to allow clearance for the removal of the AN823-3 fitting (#3-45° elbow), which lies directly above. The #6 compression nut and fitting will be used later.
- 2.5 Remove the AN823-3 fitting from the left side of the throttle body (this may be a tee on airplanes with pressurized magnetos), the #3 (3/16) upper deck pressure line (fuel pressure vent), and the AN833-3 bulkhead fitting from the engine baffling. These parts will not be re-used.
- 2.6 Remove the AN833-4 manifold pressure line bulkhead fitting from the engine baffle. This fitting will not be re-used.

3.0 ITEMS TO BE MODIFIED

- 3.1 Drill a 29/64 hole in the engine baffling where the AN833-3 fitting was removed (Section 2.5). This enlarges the hole to accept the AN834-4 Tee.

4.0 ITEMS TO BE INSTALLED

See Figures 1 through 3 for guidance on fitting locations and hose connections.

4.1 Install the 18-1001-503 Wastegate Assembly into the tailpipe in place of the original exhaust bypass elbow.

4.2 **Inspect the exhaust pipe clamp** then install the exhaust pipe with heat exchanger and exhaust bypass of the wastegate assembly in position without securing the exhaust clamp.

NOTE: Occasionally, the heat exchanger flange will interfere with the wastegate assembly and must be slightly modified to gain clearance. Contact MPi with any questions or problems.

4.3 It may be necessary to rotate both the cap and housing for proper alignment of sense line connections. Avoid unnecessary rotation.

4.4 Tighten the exhaust clamp to the proper torque (according to the latest revision of the maintenance manual). It is recommended to safety wire the exhaust clamp with MS20995C-41, or equivalent.

4.5 Use an MS21919-WDG-26 Adel type clamp to support the Upper Deck Pressure Control to the heat exchanger (lower bolt on inside flange).

Note: A 15° twist of the clamp mounting spades may assist in installing the clamp.

4.6 Install the AN823-4 fitting in the throttle body orienting it toward the center cylinder baffle AN3-84 bolt.

4.7 Install an AN834-4 tee and 90-1002-007 spacer with an AN924-4 nut using one AN960-716L washer in the engine baffling (previously occupied by the AN833-3 fitting and enlarged in Section 3.1). The fitting should be oriented with the two branches aft and near vertical.

4.8 Inspect the #6 injector line seal ring, replace as needed, and re-install the #6 injector reference line, compression nut and fitting using the original parts.

4.9 Install the A1A-04U-0180 U.D.P. sense line between the throttle body and engine baffle. Secure the center of the line using the existing AN3-84 bolt and MS21919-WDG-5 Adel-type clamp (supplied).

4.10 On the lower branch of the tee, installed in Section 4.7, install the modified reducer bushing, 90-1002-008, and connect the existing fuel gage vent line.

4.11 On the upper branch of the tee, installed in Section 4.7, install the A1A-04U-0350 flex line connecting it to the cap side (large end) of the Upper Deck Pressure Control.

4.12 Install an AN834-4 tee in the engine baffle using two AN960-716L washers and an AN924-4 nut (previously occupied by the AN833-4). The fitting should be oriented with the two branches aft and near vertical.

4.13 Re-attach the regular manifold pressure lines to the front and lower branches of the tee installed in Section 4.12.

4.14 Install the A1A-04U-0320 flex line M.A.P. manifold pressure to control line to the top of the tee, installed in Section 4.12, routing it to the outboard, or small, end of the Upper Deck Pressure Control.

NOTE: THIS IS VERY IMPORTANT. ALL STEEL BRAIDED FLEX LINES WILL CHAFE SURROUNDING ITEMS IF NOT SECURED. THE 90-1002-022 RUBBER SPACERS ARE TO BE USED AS "STAND OFFS" FOR SECURING THE LINES WITH TY-WRAPS.

4.15 Secure the upper deck pressure line and the manifold pressure line, about mid point, using a MS21919-WDG-5 clamp around each line connecting in common to the MS21919-WDG-35 around the turbocharger discharge tube with an AN3-4A bolt, an AN960-10 washer, and an AN363-1032 nut.

4.16 Install the heat exchanger's associated hoses using the original hardware.

4.17 Inspect all fittings and hardware for security, insure that adequate clearances exist to avoid chafing of engine and cowling

NOTE: SPECIAL INFORMATION FOR AIRCRAFT WITH PRESSURIZED MAGS

4.18 For intercooled or standard installations with pressurized magnetos where the pressurization source comes from the left side of the throttle body.

The MPi control is a pressure sensing device. In the past the upper deck pressure and mag pressurization air were "T"ed into the same upper left 1/8 NPT boss on the throttle body. This is not satisfactory if the mags leak pressurization air. Since it is necessary for the MPi control to use the above mentioned boss, an alternate source for the mag pressurization is preferred.

4.18.1 One option is accomplished by moving upstream from the throttle body, drilling a 5/16 inch hole in the tube and installing the MPi 20-1002-504 Mag Pressurization Clamp Assembly. The 5/16 inch hole should be about 4 to 5 inches upstream of the throttle body and oriented about 45° to the left (see Figure 2). When the Mag

Pressurization Clamp Assembly is around the duct, install a fitting so that the original mag pressure line can be reformed and connected to the new fitting.

ENGINE INSPECTION ON _____, SIGNATURE _____

5.0 CONCLUSION

5.1 Ground Check Systems

5.1.1 According to the Pilot's Operating Handbook, start and warm up engine.

5.1.2 Run up engine. Verify proper magneto drop and capability of maximum manifold pressure.

5.1.3 Ground Run Up Procedure for MPi Wastegate Control:

Step 1:

5.1.3.1 Set propeller governor for 1700 RPM.

5.1.3.2 Throttle Full Open.

5.1.3.3 M.A.P. should read at least 34" Hg (i.e. @ Sea Level)

Note: Run this condition only for the period of time necessary to obtain the data point.

Step 2:

5.1.3.4 Set propeller governor for 2200 RPM.

5.1.3.5 Increase throttle to 32" Hg. This should be obtained at about 1/2 to 5/8 of full throttle travel. M.A.P. should remain stable.

5.1.3.6 Incrementally increase throttle 1" Hg, and check for stable M.A.P.

Step 3:

5.1.3.7 Set propeller governor to full RPM.

5.1.3.8 Advance throttle to 40" Hg. This should be obtained at about 5/8 of full throttle travel.

5.1.4 Re-inspect engine compartment for leaks and check all fittings, bolts, clamps and clearances.

5.2 Complete FAA form 337 and make the appropriate log book entry.

5.3 Complete new weight and balance form, adding:
2.0 pounds at Station 45.0 for the Arrow or Dakota.

5.4 Complete and return the Owner's Registration card.

5.5 FINAL INSPECTION:

DATE: _____ SIGNATURE _____
Certificate # _____

6.0 FIGURES

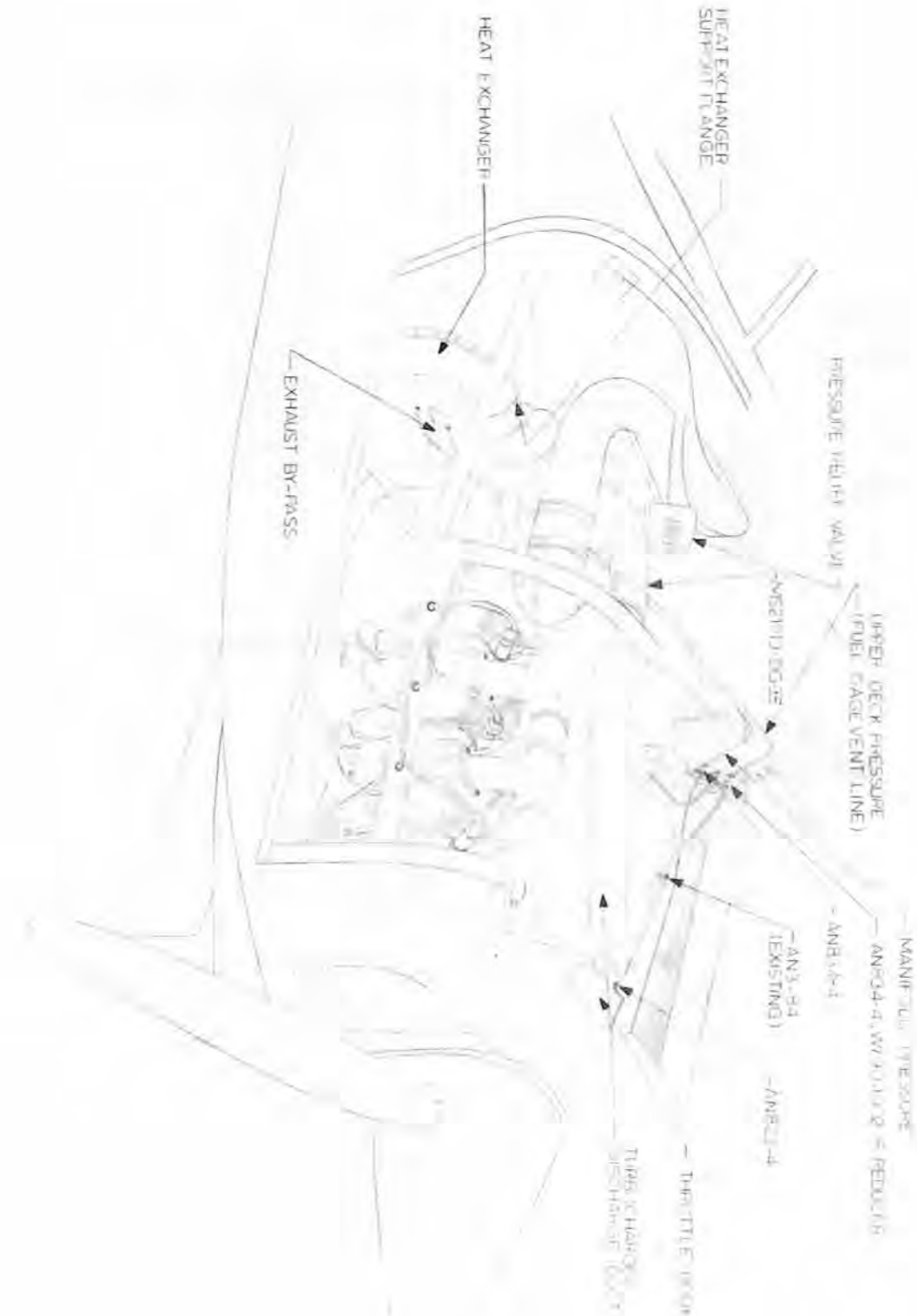


Figure 1

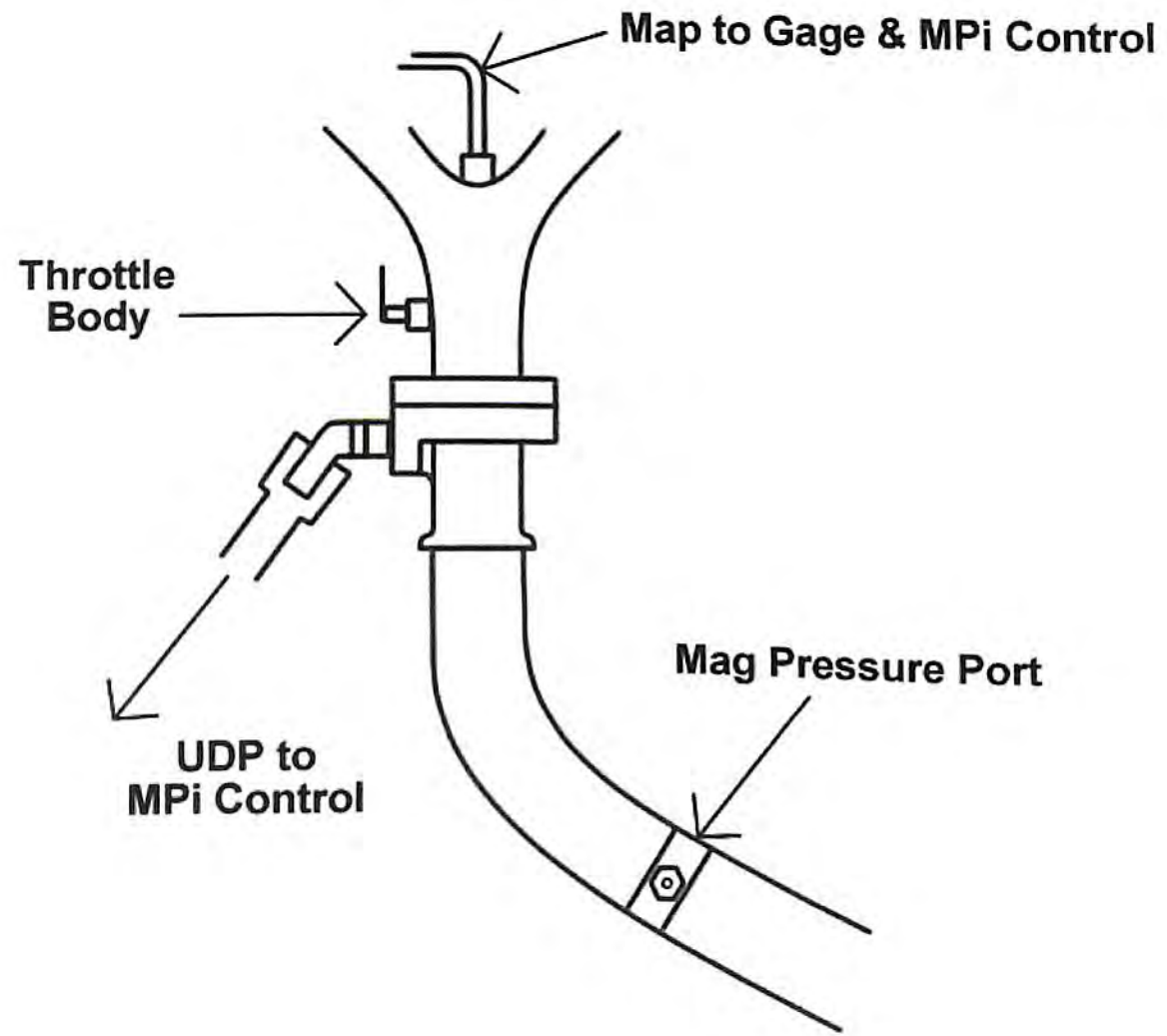


Figure 2

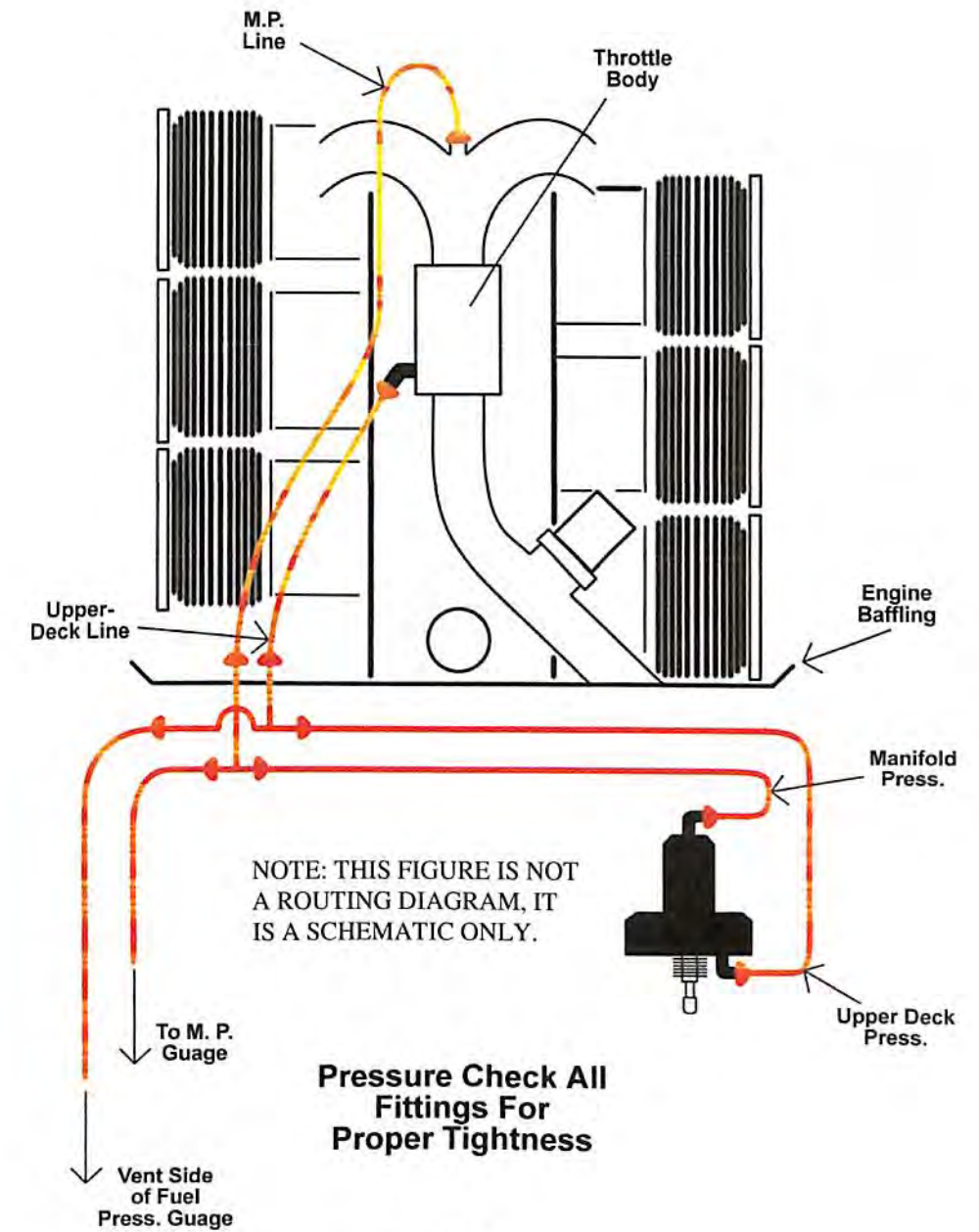
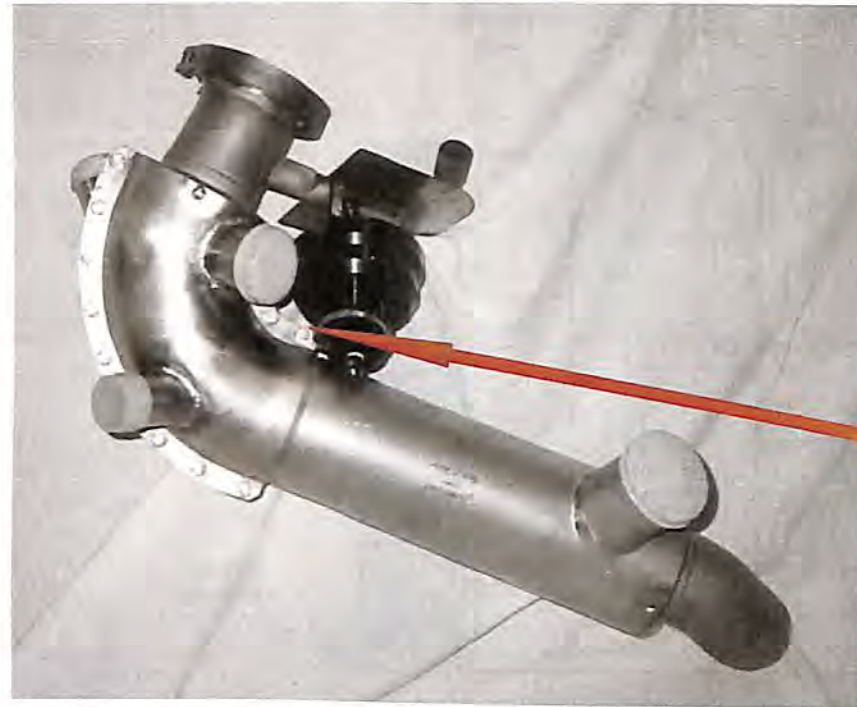


Figure 3



View 1

Opposite Side



Figure 4

Kit Serial No.

7.0 PARTS LIST



Merlyn Products, Inc.
 7500 West Park Drive
 Spokane Washington 99224
 Phone: 509-838-7500
 Facsimile: 509-838-7501
 E-mail: Suzanne@merlynproducts.com

PACKING LIST
UPPER DECK PRESSURE CONTROL — ARROW/DAKOTA

Invoice No. _____ Date: _____

Customer Name: _____

Address: _____

Telephone No. _____ Aircraft Registration & s/n: _____

Packed By: _____ Shipped Via: _____

ENGINEERING DATA

- | | | |
|---|-----------------|--|
| 1 | ORC Form | Owner Registration Card |
| 1 | PTI Form | Permission to Install |
| 2 | S.T.C. Forms | Supplemental Type Certificate SA4732NM Amended: _____
Supplemental Type Certificate SE4731NM Amended: _____ |
| 1 | MPi 18-1 Report | Installation Instructions, Revision _____ |

HARD PARTS

- | | | |
|---|----------------|-------------------------------------|
| 1 | 18-1001-503 | Wastegate Assy w/Heat Shield, Arrow |
| 1 | 20-1002-504 | MAG Pressurization Port Assembly |
| 1 | A1A-04U-0180 | U.D.P.C. Line |
| 1 | A1A-04U-0320 | M.A.P. Control Hose |
| 1 | A1A-04U-0350 | Upper Deck Engine Pressure Hose |
| 1 | 90-1002-007 | Spacer |
| 1 | 90-1002-008 | Bushing, Reducer, Modified |
| 6 | 90-1002-022 | Stand-off |
| 1 | AN363-1032 | Nut |
| 1 | AN3-4A | Bolt |
| 1 | AN823-4 | Fitting |
| 2 | AN834-4 | Fitting |
| 2 | AN924-4 | Nut |
| 1 | AN960-10 | Washer |
| 4 | AN960-10L | Washer, thin |
| 3 | AN960-716L | Washer, thin |
| 1 | MS21919-WDG-26 | Clamp, Adel |
| 1 | MS21919-WDG-35 | Clamp, Adel |
| 3 | MS21919-WDG-5 | Clamp, Adel |
| 6 | NPN | TY-WRAP, 7" |

8.0 INFORMATION RELATIVE TO OPERATION

- 8.1 The MPi Upper Deck Pressure Control is actuated at partial throttle setting. Therefore, the general operation is not changed.
- 8.2 The control allows for a broader operating range.
 - 8.2.1 Similar manifold pressure will be utilized for equivalent power settings, but the throttle will be at a somewhat different physical location.
- 8.3 Use the Pilot Operating Handbook and any superseding FAA Approved Airplane Flight Manual for all operating parameters. The MPi Upper Deck Pressure Control does not change these procedures and parameters.

9.0 CONTINUED AIRWORTHINESS

- 9.1 The MPi Upper Deck Pressure Control is designed with internal by-pass air to suppress carbon formation, which would restrict the valves motion.
 - 9.1.1 The valve only restricts the exhaust by-pass as opposed to actually "seating" completely, shutting it off. This allows the valve to operate at a more uniform temperature, which further incinerates any carbon deposits.
 - 9.1.2 Each time the engine is operated the valve is exercised through its entire motion thus further insuring freedom over its range of travel.
- 9.2 A "sticky" valve will manifest itself in a shift of the usual throttle location for a particular manifold pressure setting.
- 9.3 To check the control for internal leakage, draw a vacuum on the manifold pressure side and "valve" it closed. The Wastegate valve should move to remain in the open position.
 - 9.3.1 Use caution if you use a mechanical vacuum or pressure source. The UDP can be damaged internally. Do not exceed 10 in Hg. absolute on the MAP side or 20 in Hg above ambient on the upper deck side.
- 9.4 Attaching the sense lines in reverse may not immediately damage the UDP, but may affect its long term operation, performance and reliability.
- 9.5 If there is concern with the UDP control, send it to MPi for inspection and/or repair.
 - 9.5.1 Remove the control and exhaust bypass elbow as one piece. Send both (assembled) to MPi for testing. **Exhaust bypass elbow must be shipped with the control to MPi.**

NOTE: DO NOT disassemble the UDP control .

- 9.5.2 The UDP control should be tagged with the following information: Aircraft Registration (N#), Aircraft SN:, Kit Serial Number, Date of Removal, Total time in service and a brief description of the difficulty, include relative flight information such as OAT, PA, RPM/MAP settings, etc.

9.5.2.2 **If expedited service is required please make arrangements prior to shipping.**

- 9.6 The UDP control should be re-installed according to the installation procedures outlined in MPi Installation Report 18-1.
- 9.7 Always call if there is **any** question about the operation of the MPi Upper Deck Pressure Control.

Merlyn Products, Inc.
509-838-7500
509-838-7501 FAX
E-mail: Suzanne@merlynproducts.com

Merlyn Products, Inc.

Black Magic Upper Deck Pressure Control

Some of the Benefits:

- Increase Critical Altitude
- Increase True Airspeed – Same Power Settings
- Increase Rate of Climb
- Reduce Fuel Flow – Same Airspeed
- Lower Cabin Noise Levels
- Greater Range of Operation – more power settings available
- Increase engine and turbocharger life

Why was the system developed?

- To provide a very affordable, simple means for automatic control of the turbocharger.
- Enhance reliability of the engine and turbocharger.
- To provide turbocharger output only when needed.
- Allow for the full range of performance for the turbo system.

How the System Works:

A pneumatic operated controller automatically senses engine parameters and adjusts to maximize engine and turbocharger efficiency.

FAA Approved for the:

- Piper Turbo Dakota and Arrow III and IV (PA28-201T, PA28R-201T and PA28RT-201T)
- Piper Turbo Seneca II, III & IV (PA34-200T and PA34-220T)
- Mooney M20K (231) with the following engine(s) TCM TSIO-360-E, EB, F, FB, G, GB, K, KB and LB

Additional Information:

No change to current operating procedures
Net weight increase: 2 pounds per engine
Kit is complete, no additional parts needed
Installation is straight forward

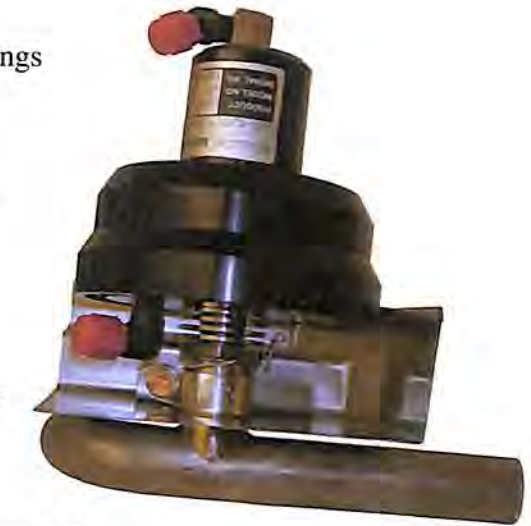
8-10 hours for the Turbo Dakota/Arrow

10-12 hours for the Mooney M20K

12-16 hours for the Piper Turbo Seneca II, III, and IV

Call Merlyn Products, Inc. to purchase your kit.

1-509-838-7500





Merlyn Products, Inc.
7500 West Park Drive
Spokane, WA 99224-5726
509.838.7500
FAX: 509.838.7501

Brief Description of the Design Criteria for the Merlyn Products, Inc. Upper Deck Pressure Controller

**for the
Continental TSIO-360-E,-EB, F, -FB, -G, -GB, -K, -KB and -LB Engines¹
Installed in the Piper Turbo Arrow², Piper Turbo Seneca³, and Mooney M20K⁴**

The Merlyn upper deck pressure control (aka automatic wastegate) is an automatic pneumatic device that operates based on the difference between the upper deck pressure and the manifold pressure. Functionally, it works by balancing the pressures. This is a simple system and was designed for the Continental TSIO-360 series engines which utilize a fixed bolt and check nut adjustment in the exhaust bypass elbow. The factory description is a "ground adjustable wastegate". The bolt effectively fixes the amount of exhaust air that the wastegate can bypass at all altitudes. At higher altitudes, considerable performance is lost leaving a very narrow range of operation. In all of the areas below where the bolt is fixed (usually 12,000' to 14,000') the engine is experiencing a great deal of back pressure, which increases heat to the cylinders, exhaust, and the turbo components. Of course, this reduces the life of those components.

The design criteria for the Merlyn Black Magic was aimed at minimizing the upper deck pressure in the most often flown range and increasing the critical altitude from 12,000 to 18,000 ft to better utilize the full capability of the engine. This gives the pilot more efficiency from the engine at lower altitudes (sea level to 9,000 ft) and increased true airspeed at higher altitudes (15,000 to 25,000). With fuel prices being what they are the added benefits are welcome

The kit is the same for the PA34-200T and the PA34-220T, there is a Flight Manual Supplement for the PA34-220T⁵ The Powerplant Limitations section limits the maximum RPM above 15,000 feet is 2600 RPM. The PA34-200T has no change to the Flight Manual. **Other than that, you fly the factory book (POH). The pilot still has to manage the throttles as there is no aneroid in this unit, but the management is significantly reduced.**

¹ Engine STC SE4731NM

² Turbo Arrow models PA28-201T, PA28R-201T and PA28RT-201T with the -F or -FB engines STC SA4732NM

³ Turbo Seneca models PA34-200T, PA34-220T with the -E, -EB, -K or -KB engines, STC SA4927NM

⁴ Mooney M30K, 231 with the -G, -GB or -LB engines, STC SA4914NM

⁵ There are no changes to any of the Pilot Operating Handbooks, except for the PA34-220T, which operates at 2700 RPM and 220 hp..

Email: info@merlynproducts.com
Website: <http://www.merlynproducts.com>



Merlyn Products, Inc.
7500 West Park Drive
Spokane, WA 99224-5726
509.838.7500 • FAX: 509.838.7501

**STC SE 4731NM and SA4932NM
THE MERLYN BLACK MAGIC CONTROL
(AUTOMATIC WASTEGATE)
FOR THE PIPER TURBO ARROW IV**

Below is a summary of the results obtained on a 1982 Turbo Arrow during STC testing.

Critical Altitude:	From 12,000' to 18,500'
Cruise Speed:	Increase 5 to 6 knots between 55% and 75% power, 8,000 to 12,000 feet
Cruise Climb:	Increase 7% (40 FPM) (33"Hg, 2450 RPM)
Broader Operating Range	30" Hg. 2,000 RPM to 15,000 feet
Max CHT in Climb:	-80F
Max Oil Temp in Climb:	-70F
Using 1" to 1.5" less MAP:	Equivalent Performance CHT down 350F OIL down 170F Fuel flow down .6 gal

Thank you for your interest in the **Merlyn "Black Magic Control"** for your Arrow.

Is your aircraft missing an important part?



Email: info@merlynproducts.com
Website: <http://www.merlynproducts.com>



Merlyn Products, Inc.
7500 West Park Drive
Spokane, WA 99224-5726
509.838.7500 • FAX: 509.838.7501

ON THE TECHNICAL SIDE

- Reduced cylinder head temperatures: for every 50⁰F decrease in temperature the life of a component is doubled.
- Reduced turbine speeds

BENEFITS OBVIOUS TO THE CUSTOMER

- Higher Critical Altitude
- Broader Operating Range and for a few
- Better climb

A broader operating range means flying to altitude using lower RPM setting and still maintaining MAP. And that equates to lower operating temperatures and a much quieter flight (as much as 3 dB).

Pilot choices. Let's look at that broader operating range a little closer in a specific application -- 53% power. We call it *Quiet Economy Cruise*.

Before Merlyn's Control: a 30" MAP, 2000 RPM was only obtainable to 8000 feet. With the control that flight parameter is obtainable to 15,000 feet. For the pilot with economy in mind that equates to a savings of 1/2 gallon of fuel per hour with the same performance obtained at 55% power. And, this is where the 3 dB reduction in noise comes in.

Using the book values for MAP, RPM and Fuel Flow at 55% to 75% power setting results in 5 to 6 knot increase in true airspeed. Or, reduce the MAP by 1.5" and burn .6 to .7 gallons per hours less fuel, and have the same performance as before the "Merlyn Black Magic". (A savings without a loss.)

A 7% increase in climb. Using 33" MAP and 2450 RPM that equates to 40 feet per minute in the Arrow equipped with the "Merlyn Black Magic".
(41", 2575 = 50 fpm increase).

Weather? Along with that nice increase in climb the increase in the critical altitude from 12,000 feet to 18,000 feet is a definite plus that can't be emphasized enough.

- Gives the pilot a lot of choices he never could have had even with an intercooler.
- Provides the technical benefits of reduced backpressure, and reduced thermal stress that the pilot doesn't see.
- The "Merlyn Black Magic" control. only weighs two pounds per engine, doesn't add to the maintenance and gives a wide range of pilot benefits including a real dollar savings,
- MAYBE IT IS MAGIC!

NOTE: No change to the POH There are no changes to the Pilot Operating Handbook* The pilot will manage the throttles in accordance with the POH, but generally with fewer throttle setting changes and less sensitivity

- except for the PA34-220T, which operates at 2700 RPM and 220 hp. The operating limitation is "MAX RPM of 2600 above 15,000 ft.
- "Arrow Benefits. Page 2

Email: info@merlynproducts.com
Website: <http://www.merlynproducts.com>

Power Setting Table -- T.C.M. 360 F Series

PRESS ALT FEET	STD ALT TEMP C	55% POWER							65% POWER					75% POWER				
		RPM 2000	2100	2200	2300	2400	2500	2575	2200	2300	2400	2500	2575	2200	2300	2400	2500	2575
MANIFOLD PRESSURE -- INCHES MERCURY																		
S.L.	15	33.2*	31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
2000	11	33.2*	31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
4000	7	33.2*	31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
6000	3	33.2*	31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
8000	-1	33.2*	31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
10000	-5	33.2*	31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
12000	-9	33.2*	31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
14000	-13		31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
16000	-17		31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
18000	-21		31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5
20000	-25		31.5	29	27.7	26.8	26	25	32.8	31.1	30	29.2	28.2		34.8	33.8	32.8	31.5

* 32 in Hg is MAX for 2 blade propellers, see operating restrictions (Ref. 53% power)

To maintain constant power, add approximately 1% for each 6 deg C above standard, subtract approximately 1% for each 6 deg C below standard.

APPROXIMATE FUEL FLOW

	BEST ECONOMY	BEST POWER
55% Power	9.2 GPH	11.0 GPH
65% Power	10.8 GPH	12.7 GPH
75% Power	12.0 GPH	14.0 GPH

NOTE: Fuel flow will vary with altitude; therefore, cruise fuel control must be accomplished by adjusting EGT (peak EGT for best economy and peak EGT plus 100 deg F rich for best power) rather than leaning to an indicated fuel flow.

NOT GUARANTEED PERFORMANCE DATA
Shaded areas indicate broader operating range
observed during actual flight test on N84719