



Service Newsletter

January 27, 1989

SNL89-2

TITLE

CONQUEST PERFORMANCE VERIFICATION

TO

CESSNA DISTRIBUTORS AND PROPJET SERVICE STATIONS

MODELS AFFECTED

Model 441/Conquest II Airplanes

DISCUSSION

Attached is Revision 2 to Garrett Service Information Letter P331-107.

This latest revision supersedes those issued with Propjet Service Information Letter PJ80-25 dated October 17, 1980 and PJ80-25 Revision 1 dated August 14, 1981.

Service personnel that are conducting engine performance checks should use these latest procedures.

* * * * *

Page 1 of 1

To obtain satisfactory results, procedures specified in this publication must be accomplished in accordance with accepted methods and prevailing government regulations. The Cessna Aircraft Company cannot be responsible for the quality of work performed in accomplishing the requirements of this publication.

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SIL

SERVICE INFORMATION LETTER

TPE 331

FOR ALL AIRFRAME MANUFACTURERS
USING TPE331 TURBOPROP, OWNER/
OPERATORS, DISTRIBUTORS, SALES AND
SERVICE ORGANIZATIONS AND FIELD
SERVICE REPRESENTATIVES.

APPLICABLE: MAINTENANCE & ENGINEERING FLIGHT OPERATIONS

SIL: P331-107
REV: 2
DATE: September 4, 1987

Applicable To: TPE331-8 Engines Used In Cessna Conquest 441's

Subject: CONQUEST PERFORMANCE VERIFICATION

The following special procedures have been developed to assist service personnel in trouble shooting the Conquest Aircraft and Powerplant systems to verify proper operation and performance.

The enclosed procedures are organized into two primary sections.

SECTION I - - - contains information for verifying proper operation of the Aircraft and Powerplant indicating systems and maintenance steps which must be conducted prior to in-flight data recording.

SECTION II - - - covers procedural information and forms to be utilized in recording in-flight performance data which, after analysis, will allow Cessna/Garrett to provide:

*Confirmation of proper Powerplant operation

-or-

*Necessary corrective action to be taken.

Prior to conducting the steps contained in Sections I and II, the following items must be on hand:

- R *Conquest Maintenance Manual D2518-11-13 (Including Revision #11 or later)
- R *Conquest Parts Catalog P674-1-12 (Including Revision #1 or later)
- R *Garrett Engine Maintenance Manual (Including Revision #15 or later)
- R *Garrett Engine Parts Catalog (Including Revision #13 or later)
- *Service Equipment (Basic and Special) listed in the Aircraft and Engine Maintenance Manuals for conducting checks called for in the attached procedures.

SECTION I

AIRCRAFT AND POWERPLANT SYSTEMS VERIFICATION

Conduct the following checks in accordance with the Conquest and Garrett Maintenance Manuals and applicable Service Information Letters.

- (1) Outside Air Temperature (OAT) Indicating System
(Conquest Maintenance Manual, Chapter/Section 31-20-00)
- (2) Airspeed Indication Systems and Delta P/P System
(Conquest Maintenance Manual, Chapter/Section 34-10-00, Airspeed)
(If required, Chapter/Section 76-11-01, Delta P/P System, Trouble Shooting)
- (3) Torque Indicating System
(Conquest Maintenance Manual, Chapter/Section 77-10-00, Torque System Calibration and, if required, Chapter/Section 76-11-01, Torque Transducer and Wiring, Trouble Shooting.) Using 293499-1 tester and pressure source, record Pin 1 voltage at 250 ft-lbs torque indication _____ and at 1669 ft-lbs torque indication _____. Enter on data sheet, Section II, Form A, for both engines.
- (4) TT2 Sensor System
(Conquest Maintenance Manual, Chapter/Section 76-11-01, TT2 Sensor, Trouble Shooting)
- (5) Igniters - - - Check for air leakage
(Cessna SIL PJ80-18 and Garrett SIL P331-103)
- (6) Engine Fuel Nozzle Check
(Garrett Maintenance Manual, Chapter/Section 72-00-00, Adjustment/Test)

SECTION I (CONT)

(7) EGT Indicating Systems

(Conquest Maintenance Manual, Chapter/Section 77-20-00, EGT System Functional Test and, if required, Chapter/Section 76-11-01, EGT System, Trouble Shooting, or Garrett Maintenance Manual Chapter/Section 72-00-00)

Perform the following checks to ensure EGT indicating system accuracy.

A. Check values of EGT compensation per Conquest Maintenance Manual, Chapter/Section 76-11-01, using milli-volt source and engine compensator circuit breaker. Record compensation values below:

	L/H Engine	R/H Engine
Actual Value	_____ °C	_____ °C
DSC Sheet Value	_____ °C	_____ °C

If the actual and DSC compensation values differ by more than 2°C, continue with Garrett Maintenance Manual, Chapter/Section 72-00-00, Adjustment/Test, to trouble shoot the compensator.

B. Check the computer delta T value as follows:

1 In computer mode, run engine at 96% RPM. Record indicated fuel flow and indicated EGT. With a Garrett 293499-1 tester, record voltages at pins (+)8 to (-)7 and at pin 13.

Fuel Flow (PPH) _____

Indicated EGT (°C) _____

Pin (+)8 to (-)7 (vdc) _____

Pin 13 (vdc) _____

2 Determine engine inlet temperature from Figure 2 using pin (+)8 to (-)7 voltage. See Figure 3 to determine delta P/P using pin 13 voltage.

TT2 (°C) _____

Delta P/P _____

3 Using TT2 and delta P/P values above, see Figure 4 and determine computer delta T (°C).

Delta T (°C) _____

SECTION I (CONT)

- (7) B. 4 In manual mode, run engine to same fuel flow recorded in step 1 and record compensated EGT.

Compensated EGT (°C) _____

- 5 Subtract compensated EGT recorded in step 4 from computer mode EGT recorded in step 1 to determine computer delta T. If this value varies by more than $\pm 2^{\circ}\text{C}$ from computer delta T recorded in step 3, trouble shoot delta P/P transducer and T2 sensor.

(8) Engine Inlet Anti-Ice Valve Check

NOTE: Compliance with Cessna SIL PJ80-20 is recommended prior to performing this check.

(Garrett Maintenance Manual, Chapter/Section 75-10-01, Anti-Ice Valve Test, Adjustment/Test Section) Should see change in EGT.

(9) Bleed Air Systems

To ensure no adverse engine bleed air leaks exist, perform steps A and B below at the same ambient conditions.

- A. With torque/EGT limit switches in "Manual", run engines on ground at 100% RPM and 1200 ft-lbs torque with pressurization source selected to "OFF". Record:

Torque - Left _____ Right _____ Fuel Flow - Left _____ Right _____

EGT - Left _____ Right _____ OAT _____

- B. Disconnect and cap P3 air supply to inlet Anti-Ice Valve and Airframe Supply Port and repeat step A. Check and record:

EGT - Left _____ Right _____

OAT _____

- C. If leak is suspected, refer to Conquest Maintenance Manual, Chapter/Section 21 for trouble shooting. Additional information is available in Conquest Maintenance Manual, Chapter/Section 71-00-02.

SECTION I (CONT)

R (10) Definition of Terms

R Cockpit indicated EGT value is where $EGT_{indicated} = EGT_{compensated} + \Delta T_{computer}$, and where $EGT_{compensated}$ is output EGT through engine
R compensator.
R

R Delta P/P Engine Pressure Ratio. Output from the airspeed pitot - static
R tube (P2) combined with engine static pressure (P5) is fed to pressure
R transducer whose output in turn goes to the computer, i.e. $\Delta P/P = (P2$
R $- P5)/P5$

R TT2 Engine total ram inlet air temperature, °C.

R Delta T computer correction to EGT; includes delta P/P increments, TT2 in-
R crement, and condition lever position.

R (11) Aircraft/Engine System Verification Using 293499-1 Tester

R If computer errors are suspected, obtain a Garrett 293499-1 tester assem-
R bly for the trouble shooting checks.

R The Garrett Engine Maintenance Manual will be necessary as reference
R material.

SECTION II

IN-FLIGHT DATA RECORDING

The following steps cover recording of in-flight performance data suitable for computer analysis.

(1) Using the attached In-Flight Data Recording Form A:

A. Record information at two altitudes and at two power settings as shown below:

- R 17,000 feet (pressure altitude) at 450° EGT, 96% RPM
R 17,000 feet (pressure altitude) at 440° EGT, 96% RPM

R 22,000 feet (pressure altitude) at 450° EGT, 96% RPM
R 22,000 feet (pressure altitude) at 440° EGT, 96% RPM

NOTE: In recording data, the following conditions should be observed:

1. Bleed air pressurization source selector must be selected to "BOTH" and functioning properly.
2. Engine inlet anti-ice switches to "OFF".
3. Windshield anti-ice switch to "OFF".
4. Do not exceed torque or EGT limits while taking in-flight reading.
5. (a) PROP SYNC switch to "OFF" (original power management system - Pre Garrett Service Bulletin 72-0455).

R (b) PROP SYNC switch to "ON" and pull PROP SYNC
R circuit breaker (new power management system
R - Post Garrett Service Bulletin 72-0455).
6. Torque/EGT limit switches to "MANUAL".
7. Readings are to be taken under smooth air conditions and after 5 minutes of stabilized airspeed before recording values.

(2) For best efficiency and accuracy, readings should be taken and recorded in the same sequence as listed on Form A. Space is provided for recording both "Cockpit" and "Computer" data.

SECTION II (CONT)

(3) Computer data is to be recorded using the 293499-1 electronic fuel control tester - - - in using the tester:

- A. Set multimeter range scale to 20.
- B. Do not connect the tester 28 VDC power cable to aircraft supply. Use the multimeter battery power supply only.
- C. When recording voltage values, note and record the polarity sign (+ or -).
- D. Multimeter black test lead will always be in test point 25 unless otherwise noted.
- E. The Form A voltage data outputs are:

	<u>PIN No.</u>	<u>Item</u>	<u>Range/Typical Values</u>
	1	Torque Transducer Output	0 to 5 volts
	22	"Conditioned EGT"	Typical Value: 0 to -0.1 volts
R	42	Primary Monopole Output	1814 Hz = 100% (See figure 1)
R	(+)8 to (-)7	Inlet TT2 Sensor Output	15°C = 0.452 volts 0°C = 0.428 volts (See figure 2)
	12	"EGT Correction"	Typical Value: 1 to 2 volts
R	13	Delta P/P Transducer Output	0 to 5 volts (See figure 3)

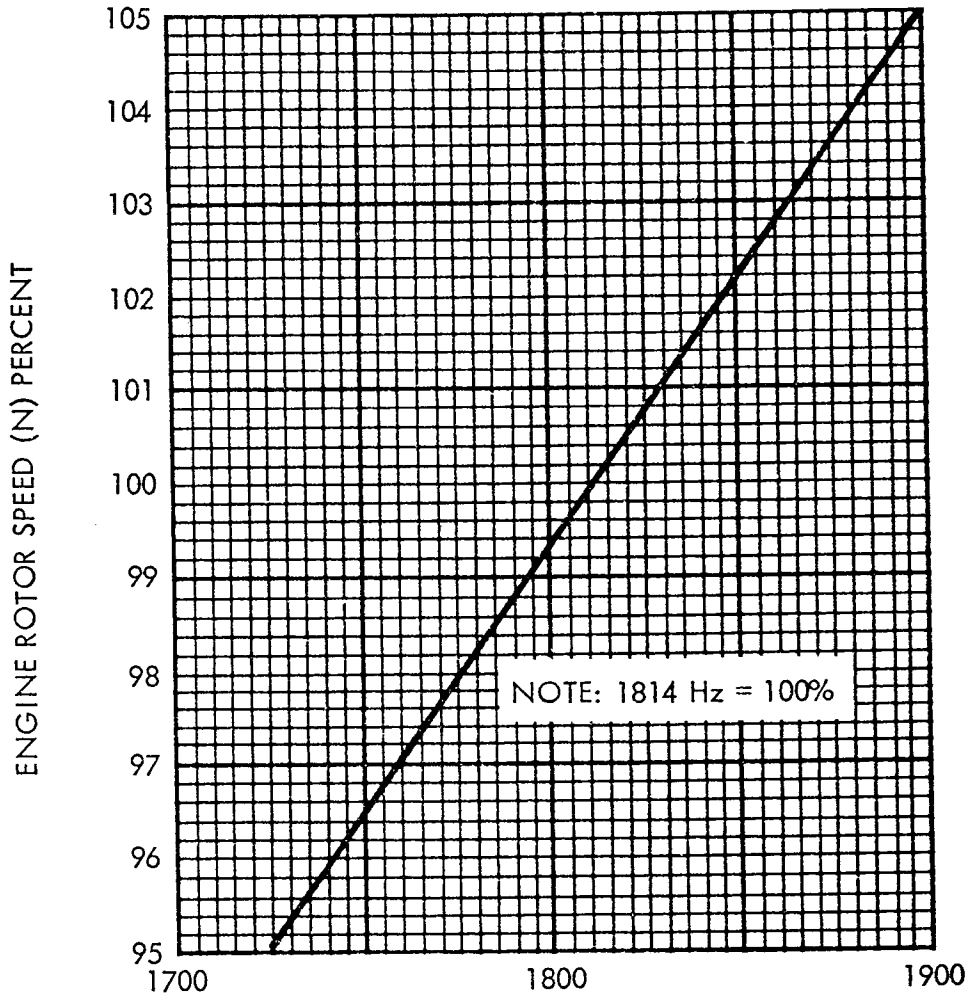
(4) When In-Flight Data has been recorded and the attached Form A completely filled out, it is to be forwarded, along with a record of compliance with Section I to the following address for analysis:

R Customer Service Engineering
 Garrett General Aviation Services Company
 2401 E. Magnolia St.
 P.O. Box 29003
 Phoenix, AZ 85038

R Attn: Conquest Performance Data
 602/225-2611

R TLX No. 0667437, GARRETSUP PHX

SECTION II (CONT)

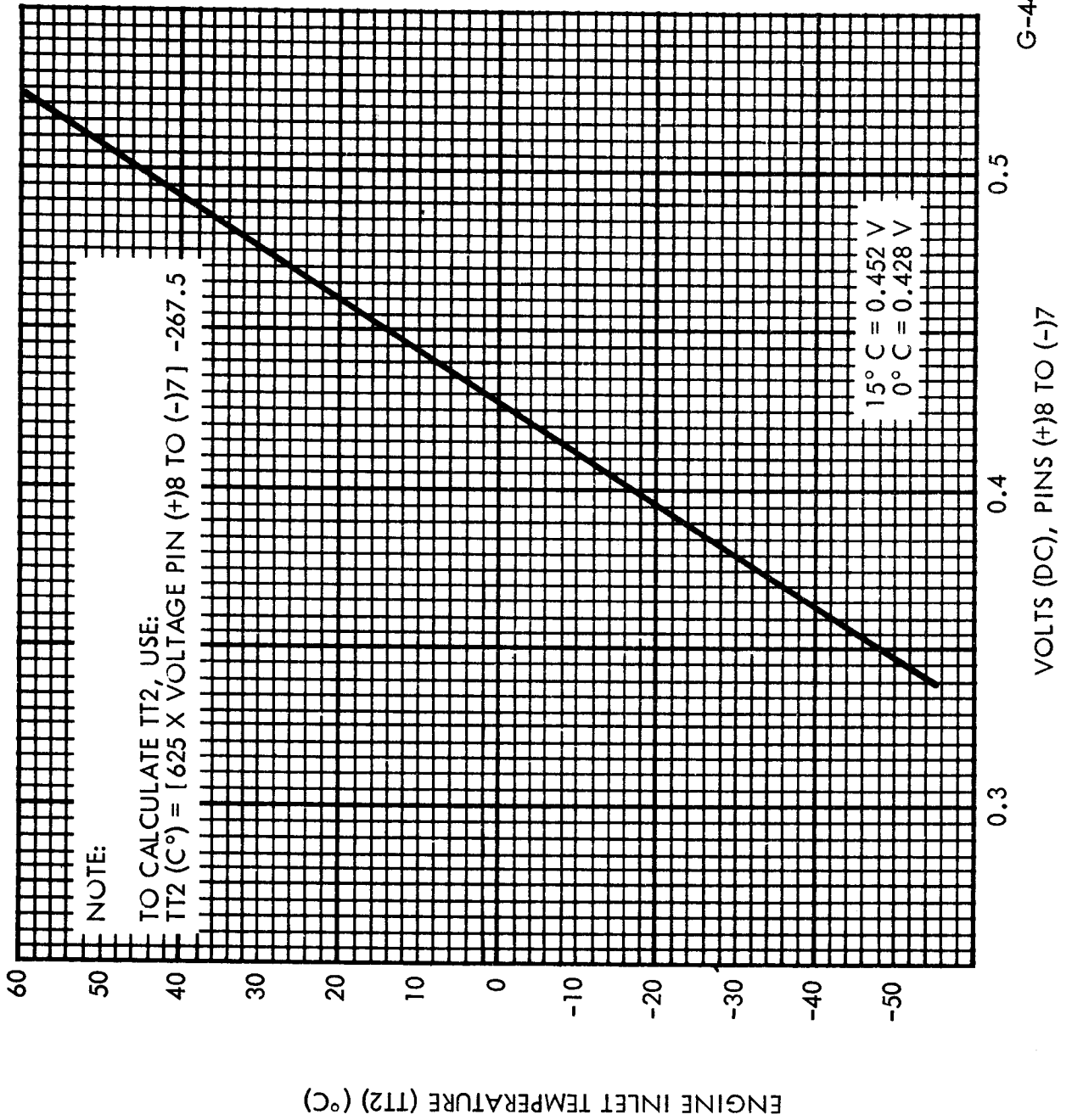


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Figure 1. TPE331-8 Engine Speed vs Monopole Frequency

SECTION II (CONT)

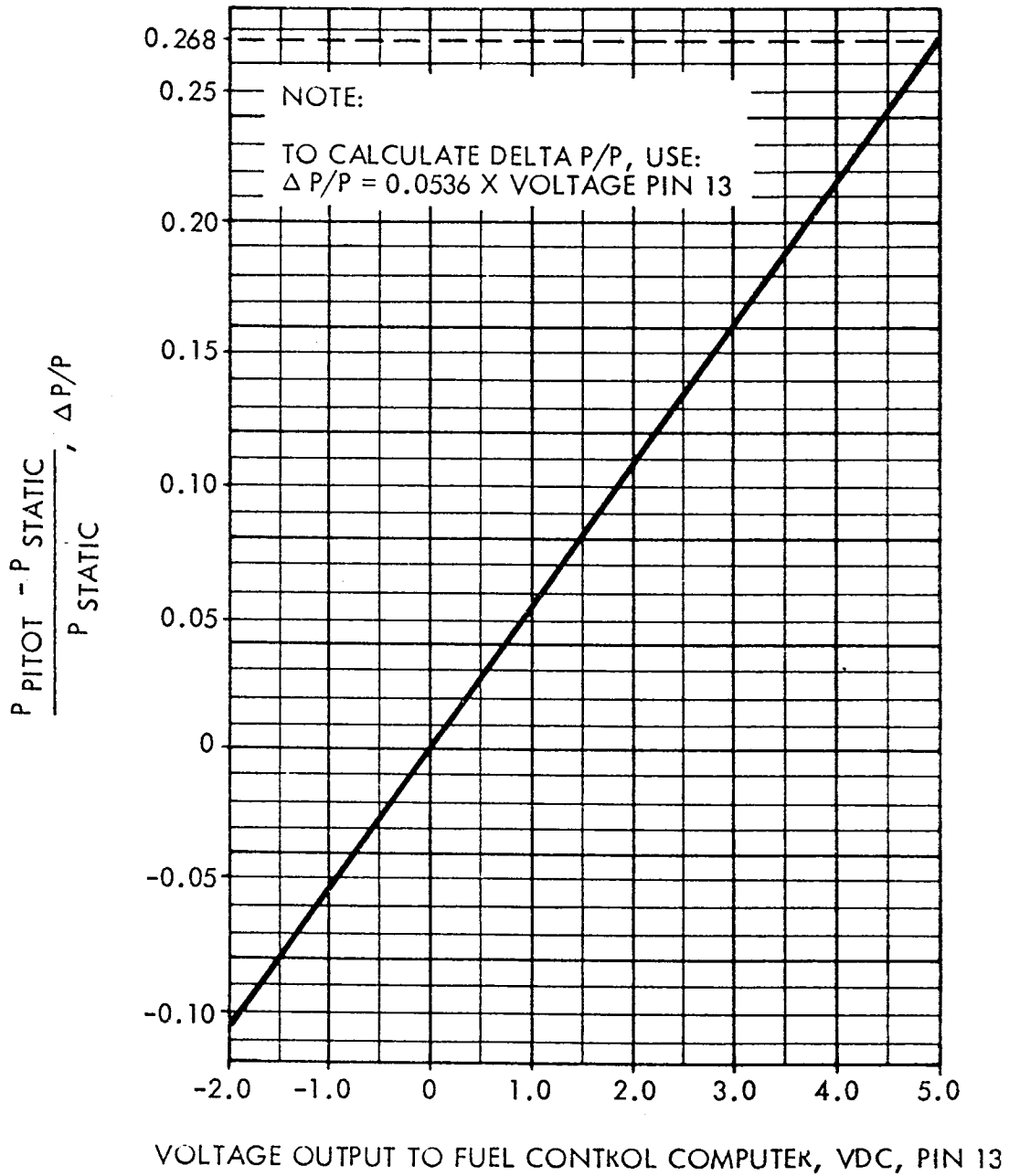
TPE331-8



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Figure 2. Engine Inlet Temperature (TT2) vs Tester Voltage Pins (+)8 to (-)7

SECTION II (CONT)



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Figure 3. Delta P/P Output To Computer For All TPE331-8 Engines

SECTION II (CONT)

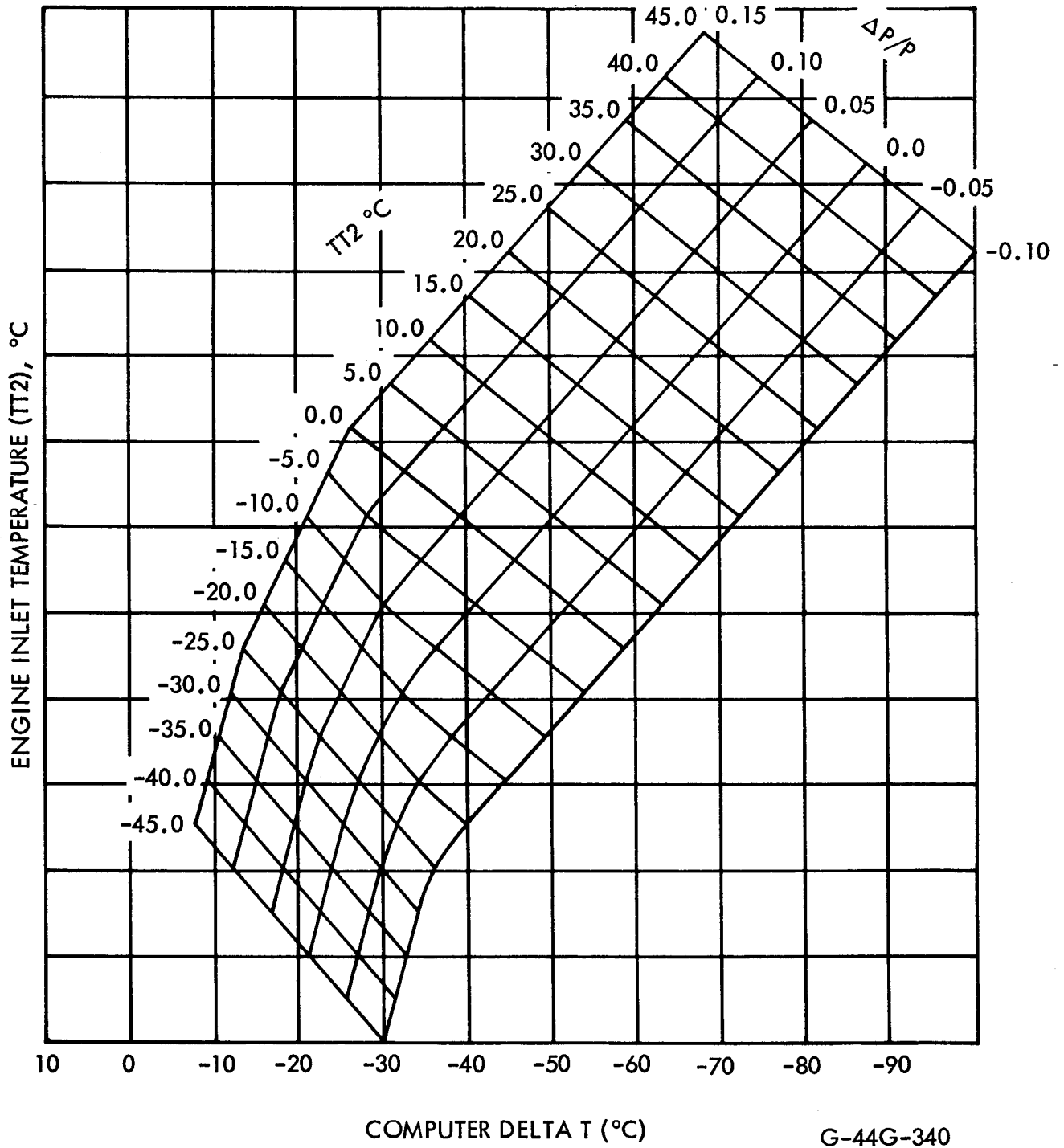


Figure 4. Check Curve, 96% RPM For Computer P/N 2101322
(TPE331-8 Powered Conquest II)

CONQUEST IN-FLIGHT DATA RECORDING FORM

P331-107 FORM A (Rev 2)

Date _____

Aircraft S/N _____ N# _____ Total Time _____ Hours
 Customer _____ A/C Location _____
 LH Engine S/N _____ Total Time _____ Cycles _____
 RH Engine S/N _____ Total Time _____ Cycles _____
 Stated Condition _____
 Data Recorded By _____
 Reply Contact _____ Phone # _____ Telex # _____

Data Pt. 1	17,000 Feet Pressure Altitude at 96% RPM	Data Pt. 3	22,000 Feet Pressure Altitude at 96% RPM
A/C Weight*	_____ LBS IOAT _____ °C	A/C Weight*	_____ LBS IOAT _____ °C
Airspeed (KIAS)	L _____ R _____	Airspeed (KIAS)	L _____ R _____
Torque (Ft-Lbs)	L _____ R _____	Torque (Ft-Lbs)	L _____ R _____
EGT (°C)	L _____ R _____	EGT (°C)	L _____ R _____
RPM (%)	L _____ R _____	RPM (%)	L _____ R _____
Fuel Flow (PPH)	L _____ R _____	Fuel Flow (PPH)	L _____ R _____
Pin 1 (Volts)	L _____ R _____	Pin 1 (Volts)	L _____ R _____
Pin 22 (Volts)	L _____ R _____	Pin 22 (Volts)	L _____ R _____
Pin 42 (HZ)	L _____ R _____	Pin 42 (HZ)	L _____ R _____
Pins (+)8 to (-)7 (Volts)	L _____ R _____	Pins (+)8 to (-)7 (Volts)	L _____ R _____
Pin 12 (Volts)	L _____ R _____	Pin 12 (Volts)	L _____ R _____
Pin 13 (Volts)	L _____ R _____	Pin 13 (Volts)	L _____ R _____
EGT - Delta P/P**	L _____ R _____	EGT - Delta P/P**	L _____ R _____

Data Pt. 2	17,000 Feet Pressure Altitude at 96% RPM	Data Pt. 4	22,000 Feet Pressure Altitude at 96% RPM
A/C Weight*	_____ LBS IOAT _____ °C	A/C Weight*	_____ LBS IOAT _____ °C
Airspeed (KIAS)	L _____ R _____	Airspeed (KIAS)	L _____ R _____
Torque (Ft-Lbs)	L _____ R _____	Torque (Ft-Lbs)	L _____ R _____
EGT (°C)	L _____ R _____	EGT (°C)	L _____ R _____
RPM (%)	L _____ R _____	RPM (%)	L _____ R _____
Fuel Flow (PPH)	L _____ R _____	Fuel Flow (PPH)	L _____ R _____
Pin 1 (Volts)	L _____ R _____	Pin 1 (Volts)	L _____ R _____
Pin 22 (Volts)	L _____ R _____	Pin 22 (Volts)	L _____ R _____
Pin 42 (HZ)	L _____ R _____	Pin 42 (HZ)	L _____ R _____
Pins (+)8 to (-)7 (Volts)	L _____ R _____	Pins (+)8 to (-)7 (Volts)	L _____ R _____
Pin 12 (Volts)	L _____ R _____	Pin 12 (Volts)	L _____ R _____
Pin 13 (Volts)	L _____ R _____	Pin 13 (Volts)	L _____ R _____

Torque Transmitter Data

Enter following torque transmitter calibration data from Page 2.

Pin 1 voltage at 250 ft-lbs torque indication Volts L _____ R _____

Pin 1 voltage at 1669 ft-lbs torque indication Volts L _____ R _____

NOTES:

(*) Actual aircraft weight at test altitude (takeoff weight less fuel burn off to test altitude)

(**) With torque/EGT limit switches in "Manual", pull Delta P/P circuit breaker, record EGT, reset C.B.