

**AIRPLANE FLIGHT MANUAL SUPPLEMENT**

**N3928V**

**Cessna R172K HAWK XP**

**This manual is an FAA approved flight manual and the original copy is in the aircraft**

BRAD E. ISHAM 210 HORSEPOWER MODIFICATION

LOG OF REVISIONS

Revision Number	Pages Affected	Description of Change	Revision by*	Date of Approved
-	all	Original	10/17/78 R.G. Puckett	
A	2	Added Floatplane		01/28/82 G.M. Baker
B	all	Reformatted, added revision page, changed address, added engine model designation, revised signature block.		01/28/91 G.M. Baker
C	all	Revised basic manual pages 1 through 4 to an electronic media format, consistency, and added P-1000 Tachometer as Appendix 1 pages 1 through 8.		08/04/00

\* For, Manager, Wichita Aircraft Certification Office

SECTION 1. GENERAL:

This modification consists of two Supplemental Type Certificates (STC). STC SE1436CE allows modification of the Continental IO-360-K and IO-360-KB engine to run at 210 horsepower for takeoff. STC SA1437CE allows use of the modified engine in the Cessna R172K airplanes. If the airplane is equipped with the Horizon Instruments, Inc. P-1000 Digital Tachometer refer to Appendix 1 of this AFMS.

SECTION 2. LIMITATIONS:

Engine Model Number: IO-360-KC/SE1436CE or  
IO-360-KBC/SE1436CE

Engine Operating Limits for takeoff and continuous operations:  
Takeoff Power -- 5minutes -- Full Throttle, 2800 RPM (210 BHP)  
Maximum Continuous Power -- 2600 RPM (195BHP)  
Propeller Blade Angle at 30 inch station:  
Landplane -- Low 9.7 degrees  
Floatplane -- Low 9.8 degrees

Powerplant Markings:

Tachometer:  
2200 through 2600 -- green arc  
2601 through 2800 -- yellow arc  
2801 -- red radial line

Fuel Flow:  
3 psi - red radial line  
4.5 through 11.5 gal/hr -- green arc  
18 gal/hr (18.55 psi) -- red radial line

Placards:  
Adjacent to existing fuel flow placard:

<b>FUEL FLOW</b>	
<b>FULL THROTTLE AND 2800 RPM</b>	
SL. ....	.17 GPH
4000 FT. ....	.15 GPH
8000 FT. ....	.13 GPH
12000 FT. ....	.11 GPH

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SECTION 3. EMERGENCY PROCEDURES -- No Change

SECTION 4. NORMAL PROCEDURES:

Takeoff:

Power -- Full Throttle and 2800 RPM

SECTION 5. PERFORMANCE:

The performance of this airplane equipped with STC SE1436CE and SA1437CE is equal to or better than the performance as listed in the original FAA approved Airplane Flight Manual.

SECTION 6. EQUIPMENT LIST -- No Change

SECTION 7. AIRPLANE & SYSTEMS DESCRIPTIONS -- No Change

SECTION 8. AIRPLANE HANDLING SERVICE & MAINTENANCE -- No Change

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SECTION 8. ADDITIONAL INFORMATION:

For additional information about the operation and installation, refer to Horizon Instruments, Inc. Document Number P103050, Operator/Installation Manual.

The exterior of the Tachometer is nameplated with all pertinent operational and configuration information, see Figure 5.

Horizon Instruments, Inc.  
556 S. State College Blvd.  
Fullerton, CA 92631

Model: P-1000 Digital Tachometer  
H/W P/N: P100-058-619-00  
Software P/N: P132001, VERS. 1.06  
6-30VDC, 150 MA., 1/2 LB.  
SERIAL NUMBER: XXXXXXX  
RESTRICTED: 2801 -- UP  
CAUTION: 2601 -- 2800  
NORMAL: 2200 -- 2600  
6 CYLINDERS  
APPLICATION: R172K WITH STC SA1437CE  
PATENT NUMBER: 4,811,255

Figure 5, Example of Product Identification  
Nameplate.

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SECTION 2. LIMITATIONS:

Engine Model Number: IO-360-KC/SE1436CE or  
IO-360-KBC/SE1436CE

Engine Operating Limits for takeoff and continuous operations:  
Takeoff Power -- 5minutes -- Full Throttle, 2800 RPM (210 BHP)  
Maximum Continuous Power -- 2600 RPM (195BHP)  
Propeller Blade Angle at 30 inch station:  
Landplane -- Low 9.7 degrees  
Floatplane -- Low 9.8 degrees

Powerplant Markings:  
Tachometer RPM ARC Placarding:  
RESTRICTED: 2801+  
CAUTION: 2601 -- 2800  
NORMAL: 2200 -- 2600

The face of the Tachometer is placarded with the Engine RPM Operating Range information that normally appears on the face of the mechanical tachometer. This includes the red restricted, yellow cautionary or transient, and green normal operation RPM ranges.

A placard is provided to label the newly installed circuit breaker for operation with the P-1000 Tachometer. This placard is placed on the circuit breaker panel. See Figure 1.

**TACHOMETER**

Figure 1, Circuit Breaker Placard

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Fuel Flow:

- 3 psi -- red radial line
- 4.5 through 11.5 gal/hr -- green arc
- 18 gal/hr (18.55 psi) -- red radial line

A fuel flow placard is added adjacent to the existing fuel flow placard.  
Figure 2.

FUEL FLOW	
FULL THROTTLE AND 2800 RPM	
SL. ....	.17 GPH
4000 FT. ....	.15 GPH
8000 FT. ....	.13 GPH
12000 FT. ....	.11 GPH

Figure 2, Fuel Flow Placard

See SECTION 3. EMERGENCY PROCEDURES -- No change.

SECTION 4. NORMAL PROCEDURES:

Takeoff:

Power -- Full Throttle and 2800 RPM

The operation of the Electronic Digital Engine Tachometer is straight-forward. After power is supplied to the Tachometer, the engine is started, and the self tests are performed, the default display of engine RPM appears on the display. The default display is insured via the use of internal timers that will restore the display to the current RPM even in the event that one of the panel buttons becomes stuck or defective.

Internally, two independent tachometers watch the pulses received from each magneto. Each tachometer is accurate to less than 1 RPM and can be individually enabled/disabled via buttons on the face of the Tachometer.

Engine operation ranges are indicated on the large green, yellow and red LEDs, see Figure 3, items D, E, and F.

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Three small LED magneto system **alert** indicator lights are located within the "Status" area on the upper left corner of the Tachometer face, see Figure 3, items A, B, and C. The left and right red **alert** indicator lights, when illuminated, indicate, because of a loss of ignition signal to the tachometer, a possible malfunction of the respective left or right magneto ignition system.

While performing a magneto check during engine run-up, the red **alert** indicator lights will illuminate, thus identifying the grounding of the respective right of left magneto systems.

Ignition Switch Position	Tachometer Magneto Alert Indicators	
	Right	Left
OFF	ON	ON
R	OFF	ON
L	ON	OFF
BOTH	OFF	OFF

Between the left and right red magneto ignition system **alert** indicators is a yellow "**RPM Synchronization**" indicator. This small yellow indicator is illuminated when there is a difference of more than 80 RPM between the right and left tachometers. This indicator also may flicker during extreme RPM excursions of the engine.

There are three panel buttons, see Figure 3, items I, J, and K. Each button has two modes of operation:

Press-and-hold,  
Press-and-release.

Press-and-hold button operations instruct the Tachometer to perform a specific operation when a button is pressed and held for more than 2/3 of a second.

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Press-and-hold button operations are placarded on the face of the Tachometer above each button.

Similarly, press-and-release button operation instructs the Tachometer to perform a specific operation when a button is pressed and released in less than 2/3 of a second. Press-and-release button operations are placarded on the face of the Tachometer below each button.

**PRESS AND HOLD OPERATIONS:**

The left button, K, upon depression, will cause the Tachometer to display the non-fractional portion (0000.) of the current accumulated engine hours. When the button is released, the fractional part of the engine hour (.00) is displayed for a short period of time. The clock is started whenever the engine RPM exceeds 800 RPM and is recorded in real hours.

The right button, I, upon depression, will cause the Tachometer to display the current contents of the RPM trap. This trap records the highest engine RPM achieved before the button was pressed.

The middle button, J, upon depression, clears the RPM trap. During depression of the switch, the RPM trap is zeroed. When the button is released, the trap will record the current engine RPM.

**PRESS AND RELEASE OPERATIONS:**

During normal operation, the Tachometer presents the average of the left and right internal tachometers on the display. However, a mechanism exists to mask either tachometer from the display, leaving the remaining tachometer to display its RPM.

A masked tachometer is indicated by the regular flashing of the right or left signal loss status indicator LEDs. This feature is handy when attempting to determine magneto/ignition problems.

Quickly pressing and releasing the left button, K, causes the Tachometer to mask or un-mask the left internal tachometer.

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For use when the Horizon P-1000 Digital Tachometer is installed

Quickly pressing and releasing the right button, I, causes the Tachometer to mask or un-mask the right internal tachometer.

An internal interlock prevents masking both internal tachometers at the same time, therefore preventing total loss of RPM indication.

If the tachometer is masked, pressing the button will un-mask it and allow its RPM to show on the display, and conversely, if the tachometer is un-masked, pressing the button will mask it from display.

Quickly pressing and releasing the center button, J, causes the Tachometer to alternately dim or brighten the LED indicators.

The LED indicators, see Figure 3, items A through F, are bright enough to overcome daylight washout conditions. However, during night operations the large green, yellow, and small red and yellow LEDs are dim-able. The large red LED still operates at full intensity to maximize the possibility of gaining pilot attention during excursion into restricted RPM ranges.

Section V. Performance:

The performance of this airplane equipped with STC SE1436CE, SA1437CE and the P-1000 Tachometer is equal to or better than the performance as listed in the original FAA approved Airplane Flight Manual.

Section VI. Weight & Balance and Equipment List:

Negligible change.

Section VII. System Description:

There is no change to the system description for STC's SE1436CE and SA1437CE. The Horizon Instruments' Model P-1000 Electronic Digital Engine Tachometer is an electronic replacement for the existing mechanical cable-driven tachometer.

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The Tachometer differs from the existing mechanical tachometer in the following areas:

The Tachometer is fully electronic and uses timing information from the primary leads ("P-Leads") of both the left-hand and right-hand magneto ignition systems, operating the Tachometer's internal left and right tachometers, to determine engine RPM instead of a rotating cable driving a magnetic slip-clutch analog type display;

The Tachometer uses super-bright LED indicators to indicate normal range engine operation (Green LED), cautionary range operations (Yellow LED), and do-not-exceed or restricted range RPM (Red LED) as substitutes for the ranges normally painted on the tachometer dial.

The primary display consists of four 1/2" high characters on a back-lit Liquid Crystal Display (LCD), easily and clearly visible in daylight and night flying.

Diagnostic features available include: **alert** indication of loss of magneto signal, indication that both magnetos are reporting different RPM, and the ability to mask RPM from either magneto.

Magneto test, via the ignition switch, is indicated by the illumination of the grounded magneto system's **alert** light and the display of the amount of RPM that the engine has slowed. This is indicated as a negative number on the display (number is preceded by a leading hyphen or minus sign);

LED indicators are dim-able (except the restricted or red-light indicator) to reduce pilot annoyance during night flying;

A specific engine hour is pre-set at the factory to accommodate tachometer changes on non-zero-time engines. Engine time may be changed only by Horizon Instruments, Inc., and must be coordinated with an authorized FAA Airframe and Powerplant mechanic or Repair Facility. Horizon Instruments, Inc. must be provided with the certificate number of a Mechanic, or Repair Station with an instrument Rating of Class 2, per FAR 145.31. Refer to Horizon Instruments, Inc. Procedure Document P118042 for additional information.

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- A) Right Magneto System Alert Indicator
- B) RPM Sync Loss Indicator
- C) Left Magneto System Alert Indicator
- D) Normal Operating Green RPM Range Indicator
- E) Cautionary Yellow RPM Range Indicator
- F) Restricted Red RPM Range Indicator
- G) Limitations Placard
- H) 4 Digit LCD Display
- I) Right switch for Overspeed Trap display and right tachometer enable/disable
- J) Middle switch for Overspeed Trap Clear and LED indicator dimming
- K) Left switch for engine hours display and left tachometer enable/disable.



Figure 3, Basic Tachometer Features

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