



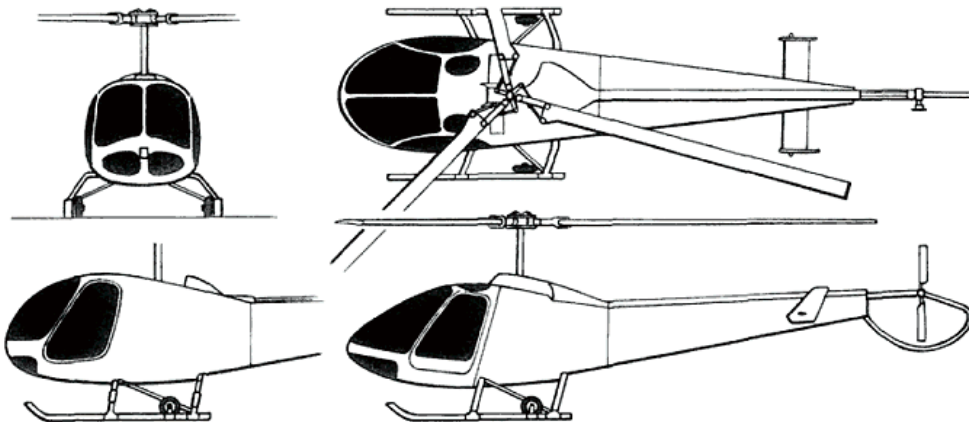
## **INSTRUCTION – PREHEAT INSTALLATION**

**Document No.: TNH2780, REV. D**

**Dated: JUL-10-2018**

**FOR  
HELI-PREHEAT KIT**

**ON  
ENSTROM HELICOPTER F-28/280 SERIES  
WITH  
LYCOMING HIO-360 ENGINE**



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## RECORD OF REVISIONS

*When updated, this document is changed in its entirety.*

REV	DATE	DESCRIPTION	BY	RELEASE
D	JUL-10-2018	ECR 2018-0012	GDO	
C	MAY-28-2014	Update format all sections	GDO	DNE
B	MAY-28-2014	Update format all sections	GDO	DNE
A	DEC-03-2011	Update part numbers and format	DNE	RCK

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## 1. PURPOSE

The purpose of this instruction is to provide guidance for the installation of the preheat kit listed on the cover page of this document. It is the responsibility of the technician and/or maintenance/repair facility performing the installation to read this instruction, become familiar with all processes, and resolve conflicting issues before proceeding. Final judgment regarding the proper installation and inspection details are the responsibility of the authority releasing the aircraft for service. Contact Tanis engineering for design change approvals as needed (952-224-4425).

**Note:** *This instruction is for the installation of both 115 Volt and 230 Volt kits. The last numbers in a part number sequence (after the dash), represent the voltage requirement 115 or 230, and may be omitted in narrative. Example: TU02615- (115 or 230).*

Referenced Tables and Figures are found in Section 5.

## 2. REQUIREMENTS

The retrofitting of this aircraft with the Tanis preheat kit is complex and is to be accomplished by competent, appropriately rated and certified technician or maintenance/repair facility.

Installation is to be in accordance with (IAW) AC43.13-1b, industry standards, acceptable methods, techniques and practices, airframe/engine manufacturer's recommendations, and approved procedures set in place by the installing authority. Securing, tying, and clamping of wire/cable is to be IAW AC43.13-1b Chapter 11, Section 9 through 12, grounding and bonding Chapter 11, Section 15, and feed-through penetration Chapter 11, Section 17.

The installation requires clear access to the engines, gearboxes and various stations throughout the aircraft to allow for wire routing.

For proper installation, work is to be performed in a clean environment under standard temperature conditions of 18°C / 65°F to 27°C / 80°F. Installation times vary depending on shop procedures, installation options, and familiarity with installation.

Required supporting documents are listed in Table 1.

### 2.1 Sourced Separately

Note: Due to shelf life limitations, pad heat element bonding sealant is to be sourced at time of installation, sealant called out in bonding instructions listed in Table 1.

Battery Heat Kit is ordered separately due to variations in battery location and requirements.

Tools, consumables, finish materials; installation hardware, brackets, lacing, and various MS21919 cushion clamps. Clamps and suggested application are listed in Table 2.

Method and mounting of the power plug and circuit protection may require sheet metal work and/or field fabricated brackets.

## **2.2 Required Tools:**

TU02905-05, 1/2-inch Slotted Socket (or equivalent).

Ohmmeter certified to traceable standard is required for inspection and troubleshooting.

Suggested:

- DT-RT1, Deutsch contact remover tool.
- TU02793, Tanis 4 way indent crimp tool (Alternate: DMC: AF8-TH163).

## **3. DESCRIPTION**

Preheating is a cold weather aviation procedure that increases reliability and safety of operations, reduces torque oscillations, thermal stress, run-up, and launch times.

Preheat is supplied through electrical resistance elements fitted in each cylinder assembly and in the form of thin pads sized and shaped to fit engine oil tank, and main rotor gearbox. Power is routed to the elements through a dedicated wiring assembly with circuit overload protection and power indicator light, and accommodations for battery heat kit. System is self-regulating, heated components reach an average state of thermal equilibrium in approximately six hours.

### **3.1 Power Requirements**

The system does not operate in flight, is not connected to or dependent on aircraft systems, and is only capable of operation when connected to a ground based power source.

System design is for operation at plus or minus 10% of system voltage requirement.

Ground based power source capable of supplying or producing required voltage and load for duration of operation is required, commonly AC (alternating current).

Refer to Table 3 in Section 5 for voltage and load requirements.

### **3.2 Operation**

Plugging and unplugging the system controls operation. Only operate the system once the installation is complete and affected component fluids are at operational levels.

For detailed information on system operation, refer to Operating Guide listed in Table 1.

### **3.3 Options**

Specific operational requirements may require modifications or additional elements. In addition, avionics and battery preheat is suggested. Heating of avionics allows for proper glass panel activation, reducing condensation build up and cold weather induced gyroscopic errors. Battery heating reduces freeze point depression, allowing higher amperage outputs and proper charge.

Modification and/or additional kits installed in conjunction with the base kit are acquired and installed separately. Total operational load is not to exceed 12-Amps.

### **3.4 Inspection and Cleaning**

Processes are in accordance with aircraft/engine manufacturer's recommendations, and 43.13-1b Chapter 11, Sections 1, 3, 4, 8, and 9. The Airworthiness Limitations section of the FAA specifies inspections and other maintenance required under §§ 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been approved.

For specific inspection and maintenance instructions, refer to ICA listed in Table 1.

### 3.5 Weight and Balance

Record the modification by updating the aircrafts equipment list and/or flight manual. As required, include an adjustment to the weight and center of gravity (CG) for the preheat kit. Approximate installed weight is 1.5 pounds (lbs). For moment arm, use engine CG.

### 3.6 Electrical Values

Preheat system and individual element values are listed in Table 3.

\* Note: Record system information as indicated in Operating Guide.

\*\*For battery heat kit information, refer to battery kit documentation supplied with battery kit.

## 4. INSTALLATION



Caution: For personal safety, and to avoid the possibility of fire, do not connect the system or any of its components to a power source until installation and Completion Check List in Section 6 has been completed.

All components are to be installed in a manner that allows for proper inspection and maintenance. Installation is not to interfere with other systems such as engine or flight controls.

Referenced documents and figures are found in Section 5.

### 4.1 Overview

Begin installation by weighing kit contents and intended installation hardware. Access various stations as required. Identify installation sites and method for mounting door and plug, elements, and cabling, then install. Perform functional test by completing checklist in Section 6.

### 4.2 Standards

Installation is to follow 43.13-1b acceptable methods, techniques and practices, industry standards, and airframe/engine manufacturer's procedures.

- 1) Wires and cables are to be supported by suitable cable ties, clamps, grommets, or other devices at intervals of not more than 6 inches apart except when contained in ducts or conduits.
- 2) Do not allow connectors to free hang. Properly secure wires and cables so movement is restricted to the span between the points of support and not on the connectors.
- 3) Supporting devices should be of a size and type, with the wires and cables held securely in place without damage to the insulation.
- 4) Adequately support and secure wire and connectors to prevent excessive movement in areas of high vibration.
- 5) Route, wiring and cabling with enough slack to compensate for movement of shock mounts.
- 6) Route, wiring and cabling in a manner that ensures system components are not in close proximity to high heat sources and use fire sleeve to protect wiring and connectors in questionable high heat areas.
- 7) Where practical, route wires and cables above fluid lines, and provide separation from fuel lines. Such wiring should be closely clamped and rigidly supported and

tyed at intervals such that contact between lines and related equipment would not occur in the case of a broken wire and/or a missing wire tie or clamp.

- 8) Check for proper installation of engine to airframe ground strap bonding.
- 9) To compensate for routing options, it is acceptable to service loop, racetrack, or shorten cables by cutting and re-terminating with appropriate connector, or lengthen with extension cable.
- 10) Use existing feed-through and fire barrier penetrations whenever possible. Feed-through penetrations are to be IAW with 43.13-1b Chapter 11, section 17. If routing requires a new fire barrier penetration use Tanis Fireproof Grommet TG01056, firewall connector kit TU03030, firewall connector kit TU03125, or approved fitting.

#### 4.3 Elements



**Caution:** When installing threaded (CHT or standard) elements, the use a 1/2 inch slotted socket TU02905-05 or equivalent (Required Tools 2.2). Refer to Tanis threaded element installation instructions found in Table 1, and applicable Aircraft Maintenance Manual for proper torque values for location of installation. Elements are not to bottom out or expose more than 2-3 threads Use spacer(s) and/or non-locking flat washer(s) as required. Torque is not to exceed 110-inch pounds. Threaded heat elements are installed one per cylinder assembly (Figures 1 and 2). Pad elements installation procedures and approved bonding sealant are called out in bonding instructions listed in Table 1 Section 5.

##### Element combinations.

Standard Kit: 4 ea. TTP2771- Standard element, used as fastener replacement on intake or rocker cover, leaving CHT wells open.

Factory Legacy Kit: 1 ea. TTP2771- Standard element used on cylinder w/factory CHT sensor installed, 3 ea. TTP2628- Legacy CHT element.

TTP2771- Standard (fastener) element (1/4-20 50-watt). Install using slotted socket and factory torque for location of installation. When replacing rocker cover fastener install in a location with the greatest area of mass and maximum thread engagement, normally this will be a blind hole on the intake side. When installing as intake fastener do not use washers or spacers or exceed a torque value of 110-inch pounds.

TTP2628- Legacy (CHT) element (3/8-24 50-watt), installed in CHT well. Torque is not to exceed 35-inch pounds.

Both kit configurations include the following elements:

Engine oil tank/sump 1 ea. TEP2653- pad element (2 x 3 inch 40-watt), location should be flat and clear of oil drip points (Figures 1 and 3).

MRGB 3 ea. TEP2664- pad element (3.15 x 1.75 inch 50-watt), locate on flat area between lower ventral fins. (Figure 10)

Battery heat element(s) ordered separately, varies by order (Figure 4). Battery element installation does not use bonding sealant. Wrap element around the perimeter of vertical surface with flat side toward battery. Element ends should not overlap. Use cable-ties or appropriate lacing, and gently lace element in place. Pull lacing gently and alternate

tension between grommets while avoiding power lugs and sensor connector. Adaptor panel (TB02645) may be supplied for fitting around terminal and sensor contacts. While lacing element in place, do not pull too hard, this could result in pulling grommets out. Refer to battery ICA listed in Table 1, for installation and maintenance information.

#### **4.4 Suggested Cable/Wire Routing**

Route wiring/cabling between the elements, junction and shore power plug adjust lengths as required. It is acceptable to cut and re-terminate as required. Seal connectors when not in use with sealing plug (DT06-2S-C017). Reference cable kit wire diagram for additional information and Figures 5 through 9:

Routing of cabling or engine heating elements can be in conjunction with ignition leads or along the side of the lower case attached using clamps, sump bolts and or cable ties. Any of the output leads from engine junction A can be used to supply power to junctions B and leads from either junction can be used to connect the MRGB junction C.

1. Layout the cabling as shown in cable kit diagram.
2. Mount power plug and indicator light with cushioned clamps, cable ties or other appropriate means in an accessible location. Optional flush mount power plugs and doors are available (Figure 6).
3. Mount junctions A and B, on or ignition leads near the left and right magnetos, or attach junctions to the lower case using clamps and sump bolts.
4. Locate MRGB cable junction on, or in the vicinity of, the of the main rotor gearbox.
5. Route leads to elements and interconnect junctions.
6. Cap unused cable connectors using the supplied grey sealing plug.
7. Excessive Cable length can be adjusted by race-tracking or cutting and re-terminating.

## 5. TABLES AND FIGURES

**TABLE 1 - Supporting Installation Documents**

\* Note: Record documents as indicated in Operating Guide.

02780	Preheat Kit - Item List
02781	Cable Kit - Wire Diagram
TN02628	Instruction - Threaded Element - CHT 3/8-24
TN02771	Instruction - Threaded Element - Standard 1/4-20
TN02788	Instruction - Bonding
TN03039	Instruction - LED Indicator Light (Optional)
TCA0003	Instructions for Continued Airworthiness (ICA)
TPG0005	Pilot Guide

**TABLE 2 - Cushioned Clamp Reference. (Alternate: MS21919WCH-)**

(Clamp sizes vary by manufacturer, properly size for secure fit)

Size	MS number	Application
1/8"	MS21919WDG-2	1 - 2 wire
1/4"	MS21919WDG-4	2 - 3 wire
5/16"	MS21919WDG-6	8mm Indicator light
5/8"	MS21919WDG-10	2 contact connector
7/8"	MS21919WDG-14	3 contact connector and fused link
1"	MS21919WDG-16	4 lead junction
1 3/16"	MS21919WDG-19	6 lead junction (WCH-18)
1 1/2"	MS21919WDG-24	Circular shore power plug

**TABLE 3 - System Values +/- 10%**

\* Note: Record system information as indicated in Operating Guide.

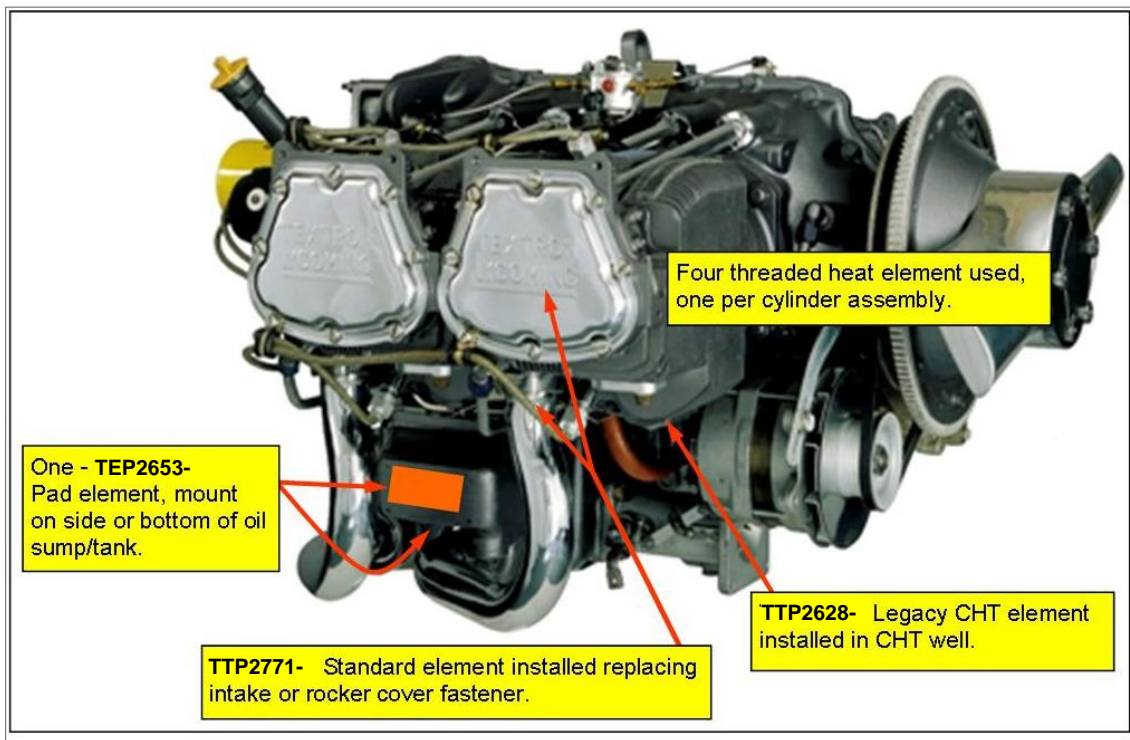
**115 Volt kit                      3.4 Amps                      390 Watts                      33.9 Ohms**

Element P/N:	Wattage	Ohms
TTP2628-115/50	50	264.5
TTP2771-115/50	50	264.5
TEP2653-115/40	40	330.6
TEP2664-115/50	50	264.5

**230 Volt kit                      1.7 Amp                      390 Watts                      135.6 Ohms**

Element P/N:	Wattage	Ohms
TTP2628-230/50	50	1058.0
TTP2771-230/50	50	1058.0
TEP2653-230/40	40	1322.5
TEP2664-230/50	50	1058.0





**Figure 1** Engine elements: Four threaded elements, one per cylinder assembly and one pad element on oil tank/sump.



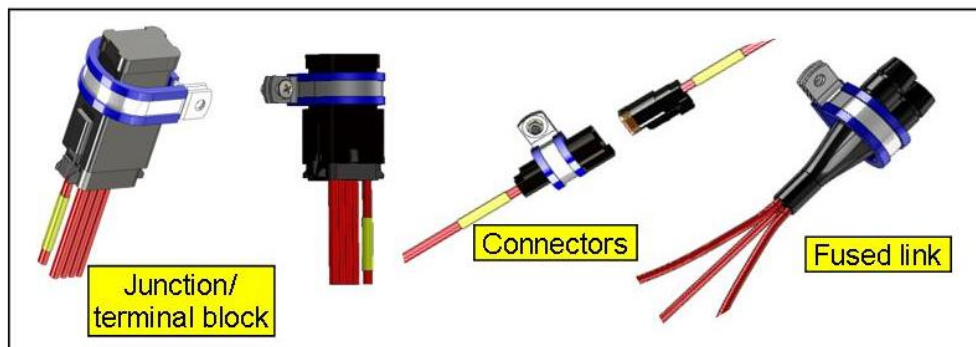
**Figure 2** Threaded elements installation options, one per cylinder.



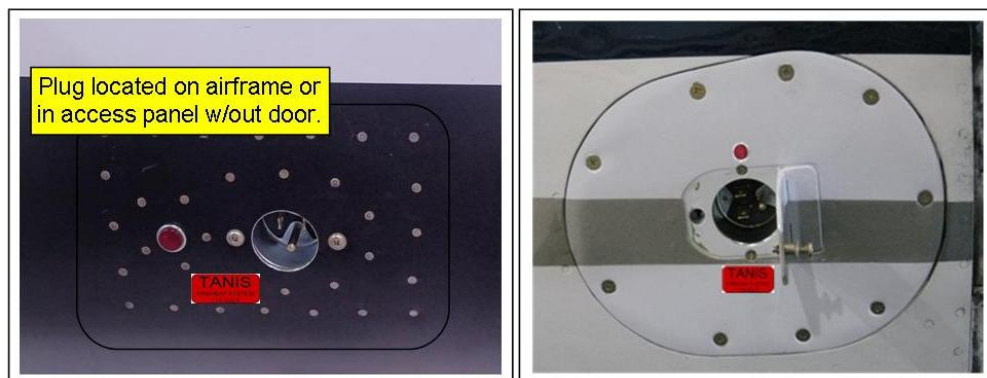
**Figure 3** Generic element shown with 6 inch lead, connector and yellow label with part number.



**Figure 4** Example of optional TB02800 series battery heat kit element



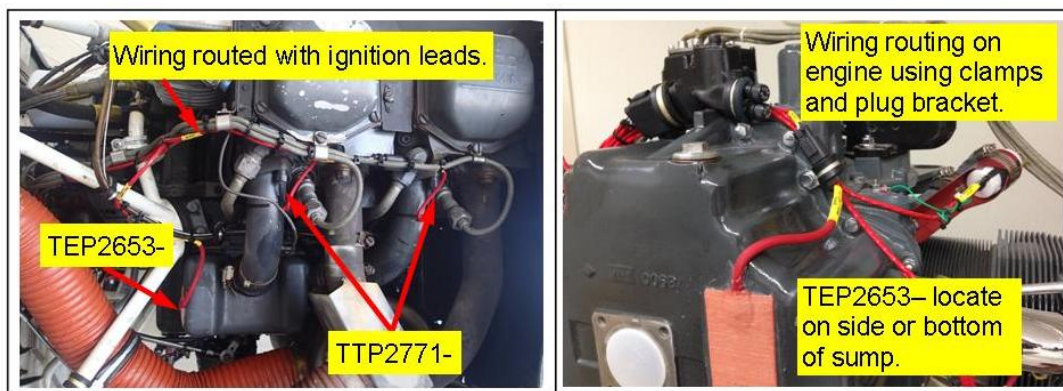
**Figure 5** Examples for positioning of cushioned clamps when used.



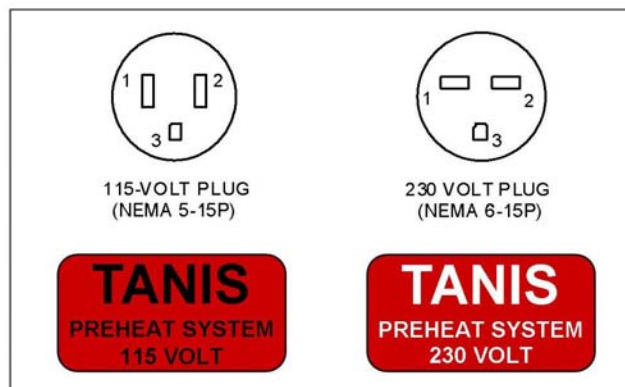
**Figure 6** Examples of optional plugs mounted on airframe.



**Figure 7** Examples of plug mounting options: Left - TU01062 circular plug bracket, Right plug secured with cushioned clamps, and TU01062 bracket.



**Figure 8** Suggested wire routing options.



**Figure 9** Shore power plugs and placards. Note: Standard Tanis placard shown, appropriate alternates listing Tanis Preheat and voltage are acceptable.



**Figure 10** Example of a MRGB element placement on flat area between lower ventral fins. Install as required spreading heated area as much as possible.



## 6. COMPLETION CHECK LIST



Caution: Do not touch hot elements they can burn bare skin.

Before proceeding, verify system is not powered or connected to a power source.

Verify all elements are properly connected and bonding sealant is cured.

Follow in sequence, record as indicated, and check off when completed.

If a discrepancy is found, correct before proceeding to the next step.

\* Skip when not installed.

[ ☒ ] Check the system as follows:

1. [ ☐ ] Verify system components are installed in accordance with kit installation instructions.
2. [ ☐ ] Verify engine to airframe/engine bonding (ground strap) is as per OEM requirements.
3. [ ☐ ] Verify preheat system ground by checking for continuity between shore power plug ground, pin 3 (Figure 9), engine, and airframe.
4. [ ☐ ] Using an ohmmeter, verify there is no continuity between shore power plug pins 1 and 2, and the ground pin 3.
- 5) [ ☐ ] Using an ohmmeter, measure resistance between the power pins 1 and 2, and record total system resistance: \_\_\_\_\_. Compare with values in Table 3.
- 6) [ ☐ ] Connect the system to appropriate power.
- 7) [ ☐ ] Verify power indicator light is on (illuminated).
- 8) [ ☐ ] Within 30-minutes, area adjacent to the elements will start to feel warm. Check each element individually..
- 9) [ ☐ ] \* While system is warming up, freeze (0°C) battery thermal control, then test battery heat element for heat. This element can be touched, as wattage density is low.
- 10) [ ☐ ] Update/modify weight and balance, and installed equipment lists (Section 3.5).
- 11) [ ☐ ] Complete/fill-in blanks on first and last pages of Operating Guide listed in Table 1, and file with POH/AFM.
- 12) [ ☐ ] Appropriately file supplied Instructions for Continued Airworthiness (ICA), and installation documents with aircraft manuals and logs.
- 13) [ ☐ ] Make a log entry to comply with 14 CFR Part 43.9 or other procedures set in place.
- 14) [ ☐ ] Complete and return Registration/Warranty Card.
- 15) [ ☐ ] Complete Sign Off in Section 7.

**7. SIGN OFF**

The undersigned found the system installed and operating correctly.

Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**Preheat Kit**

Part Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

**Airframe**

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Registration: \_\_\_\_\_

**Engine**

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

System test performed by: \_\_\_\_\_

(Signature)

\_\_\_\_\_  
(Printed name, title and certificate number, if applicable)

\*\*\*\*\* NOTHING FOLLOWS \*\*\*\*\*