TANIS
AIRCRAFT PRODUCTS

INSTRUCTION – BATTERY HEAT INSTALLATION

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BATTERY HEAT INSTALLATION
ON

Ni-Cad and Lead Acid batteries

RECORD OF REVISIONS

When updated, this document is changed in its entirety.

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CONTENTS

1. PURPOSE

The purpose of this instruction is to provide guidance for the installation of the individual Tanis battery heat components and or Battery Heat Kit. These instructions may supplement higher level kit instructions and ICA information. It is the responsibility of the technician and/or maintenance/repair facility performing the installation to 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.

Note: *This instruction is for the installation of both 115 Volt and 230 Volt kits and components. Letters before and after the 4 digit drawing numbers are modifiers used for article configuration and maybe omitted in narratives. Example: TBP2646-115/60 =* ***T****anis* ***B****attery element with a* ***P****in connector (2646) 115-volts and 60-watts.*

2. REQUIREMENTS

Referenced documents, tables, and figures are located in Section 5.

Retrofitting of this aircraft with a Tanis cold weather modification is to be accomplished by appropriately qualified technician or maintenance/repair facility.

- Retain documents and make record as indicated in this document (Section 5), and higher level Operating Guide and ICA.
- Work is to be performed in a clean environment under standard temperature conditions of 18°C / 65°F to 27°C / 80°F
- Installation requires clear access to the battery
- Installation times vary due to a wide range of variables such as battery location, power connection and/or plug mounting option used
- Installation is to be in accordance with (IAW) current regulatory requirements, airframe manufacturer's procedures, and approved procedures set in place by the installing authority. Reference AC 43.13-1B Chapter 11, Sections 9 through 12 for securing, tying, and clamping, Section 15 for Grounding and bonding, and Section 17 for feed-through penetrations
- When installing independent of primary preheat kit battery kit power connection/inlet (shore power plug) is to incorporate a non-locking blade type NEMA connector (Figure 1)
- A corresponding outlet/receptacle connector is required on power connection/extension cord. Additional approved outlets (TP02872-115, TP02829-230).

2.1 Hardware

Installation hardware, consumables, finish-materials, brackets, lacing, and various MS21919 cushion clamps (Table 2).

- When penetrating sheet metal or composites refer to and follow manufactures procedures and 43.13 1B
- For cable modifications and/or re-terminating reference supplemental connector instructions and wire diagrams. Additional connectors may be required for interconnecting with existing Tanis kits or for standalone installations.

2.2 Tools

Various standard aviation hand tools are required and are not supplied.
Required:

- Ohmmeter certified to traceable standards

Suggested:

- Deutsch contact remover tool: DT-RT1 or equivalent
- Tanis 4 way indent crimp tool: TU02793
  - Alternate crimp tool, DMC: AF8-TH163 or equivalent

2.3 Power

Power supply and shore power connection (extension cord) supplied by operator.

- Battery heat system power is commonly supplied through primary Tanis preheat system.
- Independent/stand alone battery systems connect to shore power through dedicated power plug/inlet.
- Ground based power source capable of supplying or producing required voltage and load for duration of operation is required, commonly AC (alternating current)
- System design is for operation at plus or minus 10% of system voltage requirement
- Voltage and load requirements recorded in Section 5, Table 3

3. DESCRIPTIONS

Preconditioning/heating of batteries reduces freeze point depression, and allows for higher amperage outputs and proper charge

- The battery heat system is thermostatically controlled
- Powered by ground/shore power and is not operational in flight
- Battery Heat Kits may be installed as an independent system, or in conjunction with primary Tanis preheat system
- Heated batteries reach an average state of thermal equilibrium in approximately six hours.

3.1 Physical Attributes

Preheat is applied through electrical resistance heat in the form of thin element in contact with battery. Belt type battery heat element(s) are fitted around the perimeter of battery(s). Pad type battery heat elements are mounted in direct contact with side(s) of batteries located in boxes or in confined locations. Power is routed through wiring assembly that incorporates an ambient air sensing thermal control. Independent battery systems normally incorporate shore power connection (inlet plug), power indication, and circuit overload protection.

3.2 Technical Specifications

Battery system and individual element values are to be recorded in Table 3.

3.3 Weight and Balance

Installed weights vary from less than one pound to upwards of two or more pounds for multi battery systems. Individual component weights are negligible, a complete system should be considered for weight and balance calculations.

- Record modification, update equipment list, and/or flight manual
- Include adjustment to weight and balance as required
- For moment arm, use battery CG

3.4 Operation

⚠ **Caution:** Before connecting power complete Functional System Check in Section 6.

3.5 Maintenance

Thermal control and circuit protection replacement parts/articles are listed in ICA and associated Cable Kit – Wire Diagram as recorded in Table 3.

- Refer to Instructions Continued Airworthiness for inspection and cleaning procedures. All processes are IAW 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 by 14 CFR Part 43.16 and 91.403, of the Federal Aviation Regulations unless an alternative program has been approved.

3.6 Options

Specific operational requirements may require alternate component, and/or additional elements. Modifications and/or additional kits are available for installation with base kit.

- Avionics/cabin: Heating of avionics allows for proper glass panel activation, reduces condensation and cold weather induced gyroscopic errors
- Plug Door kits: TD02840 Single Place Door Kit , and TD03095 2 Place Door Kit
- System interconnect kits are available
- Circular shore power plug connector (inlet), TP02770-115 and TP02980-230
- Interior Outlet Kit: TC03071
- Circuit protection (alt): Tanis 03013 series Dual Fused Link, HTB-42I mountable fuse holder, MS26574-10 and MS3320-10 breakers
- Firewall Connector Kit: TU03030 (5015/38999 crimp type power plant dismount)
- Fireproof Grommet Kit: TG01056 (approved firewall and bulkhead through fitting)
- Connector Kits: Tanis 2598 and 2603 series, TU03047, and TU02968 (5015/38999 crimp type disconnect)
- Contact Tanis Aircraft Products for additional options

4. INSTALLATION

Referenced documents, tables, and figures, located in Section 5.

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.

- Record as indicated in this document (Table 1), Operating Guide and ICA
- Preheat system and individual element values are to be listed in Table 3

4.1 Overview

(1) Review all instructions and documents listed in Table 1.

(2) Before beginning installation weigh battery element(s), cabling and installation hardware.

(3) Identify installation site and method of installation and power connection.

(4) Install components per instructions.

(5) Record and retain documents as indicated in Operating Guide and ICA.

(6) Complete Functional System Check and Sign Off in Sections 6 and 7.

4.2 Standards

Installation is to be IAW current regulatory requirements (AC 43.13-1B.), and airframe/engine manufacturer's procedures.

Listing below may supplement above procedures:

(1) Wires and cables are to be supported by suitable lacing, cable ties, clamps, grommets, or other devices at intervals of not more that 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, cable/wire 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 tied 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) To compensate for routing options it is acceptable to service loop, racetrack, shorten or lengthen, wires/cables by cutting and re-terminating with appropriate contacts, splice or connector.

(9) Check for proper installation of engine to airframe ground strap bonding.

(10) When penetrating composites follow approved airframe manufacturer procedures and reference AC 43.13-1B Chapter 3 as needed. When riveting use appropriately sized blind rivets (aluminum or Monel MS, CR and NAS), assemble wet and seal A/R with PS 870 or equivalent (MIL-PRF-81733).

(11) When working with sheet metal, reference AC 43.13-1B Chapter 4, Section 4. Use appropriate rivets per installation. For structural installations, rivet layout is to be patterned after a small patch, similar to Figure 4.16 of AC 43.13-1B. Assemble wet and seal A/R with PS 870 or equivalent (MIL-PRF-81733).

(12) When penetrating firewall reference 43.13-1B Chapter 11, Section 17.

4.3 Battery Heat Element

⚠ **Caution:** Do not connect to power until installed and Functional System Check in Section has been completed.

Operational requirements or modifications may require additional and/or alternate elements.

(1) Verify individual element resistance before installing (Table 3).

(2) Element positioning and lead orientation may vary from figures.

(3) Contaminants such as dirt, grease, and/or processing lubricants, must be removed from battery prior to installing heat element. Wrap element around battery perimeter with flat side toward battery. The element should be smaller than battery circumference, ends should not overlap.

(4) Use cable-ties or appropriate lacing, and gently lace element in place alternating tension between lacing and grommets avoiding power lugs and sensor connectors. Be careful not to pull too hard, this could result in damage the belt or in pulling grommets out.

(5) Adaptor panels are available for custom fitting around lugs, etc. Panel modification varies by battery configuration and/or other installation considerations.

(6) Installations which have a battery box may need a hole drilled in the box for the element lead to pass through. If this is the case, locate the hole adjacent to the battery heat element lead as installed on the battery and install appropriate grommet and seal as required.

(7) Pad type battery heat element(s) not installed around parameter of battery are placed in-between battery and battery containment/box wall.

(8) When installing in confined areas protect element from abrasion and snags. Thin cardboard or other appropriate protector can be used to protect the element from sharp edges and aid in easing the battery and or element into the box, remove the cardboard once installed.

4.4 Cable Routing

Review Tables and Figures in Section 5, and associated Cable Kit - Wire Diagram.

- Routing is suggested; variations in aircraft configuration may require deviation

1. Power connection/inlet: Identify method for power connection. May be interconnected with primary preheat system or installed independently. When installing independent of primary preheat kit, battery kit power connection/inlet (shore power plug) is to incorporate a non-locking blade type NEMA connector (Figure 1).
2. Thermal Control: Secure the thermal control 6 to 18 inches (15 to 46 cm) from battery using Click Bond cable mount or equivalent, or with existing wiring. Once the cable is routed and secured, connect the battery element.
3. Indicator light: Option – When supplied installed in visible location adjacent power plug. Reference instruction TN03039 for mounting and assembly.
4. Ground: Varies by installation. System is to be appropriately bonded adjacent to shore power plug/inlet.
5. Circuit protection: Varies by installation, battery cabling may have independent inline circuit protection upstream of Thermal Control. Circuit protection not to exceed 12 amps.
6. Complete Functional System Check and Sign Off, Sections 6 and 7.

5. TABLES AND FIGURES

TABLE 1 - Supporting Installation Documents

* Note: Record in blanks associated installation documents, and retain.

TPG0002	Operating Guide – Battery Heat System
TICA2800	ICA – Tanis Battery Heat Systems
TN02793	Instruction - Connector (termination and assembly)
	Engine Preheat Kit - Item List
	Cable Kit - Wire Diagram

TABLE 2 - Cushioned Clamp Reference. (Alternates: MS21919 WCH / WCE)

(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-5	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 - Technical Specifications **(**To be completed at installation)

Record installed part numbers and values below and in Operating Guide when required.

To calculate the specific wattage of an individual element or installed system, measure total resistance between the contacts 1 and 2 (Figure 1) and use the following formula.
Voltage squared, divided by Resistance = Wattage ($V^2/R=W$).

To calculate resistance value of an element using the part numbers the digits after the dash (-) callout voltage and the numbers after the slash (/) callout wattage.

Voltage squared, divided by Wattage = Resistance ($V^2/W=R$).

System: Volt :_____ Amps:_____ Watts:_____ Ohms:_____
(Recorded at time of installation)

Common elements: (Values +/- 10%)

Pad Element Description	**Part Number**	**Wattage**	**Ohms**
(Pad Element)	(TBP2645-115/60)	(60)	(220.4)
	Total wattage:		

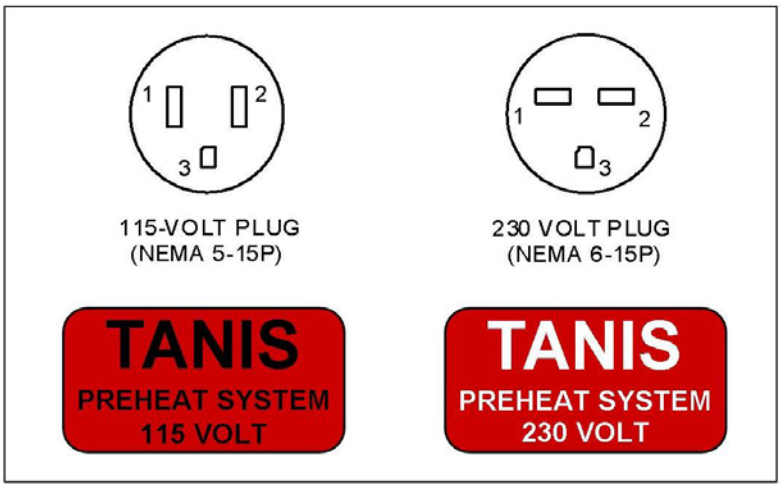

Figure 1 - Shore power plugs and placards. Placard that states at a minimum, *Tanis* and the system voltage requirement (*115 Volt* or *230 Volt)* is acceptable.

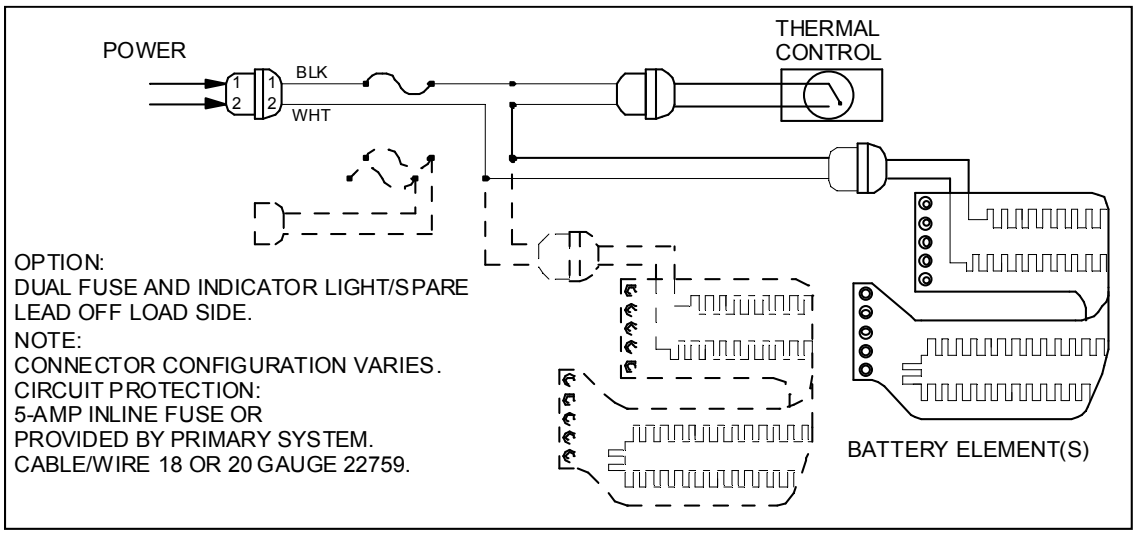

Figure 2 - Typical wire diagram. Systems with more than one element may distribute power through terminal block/junction. Dual fuse options are available. Power indicator light may be incorporated off load side of circuit protection.

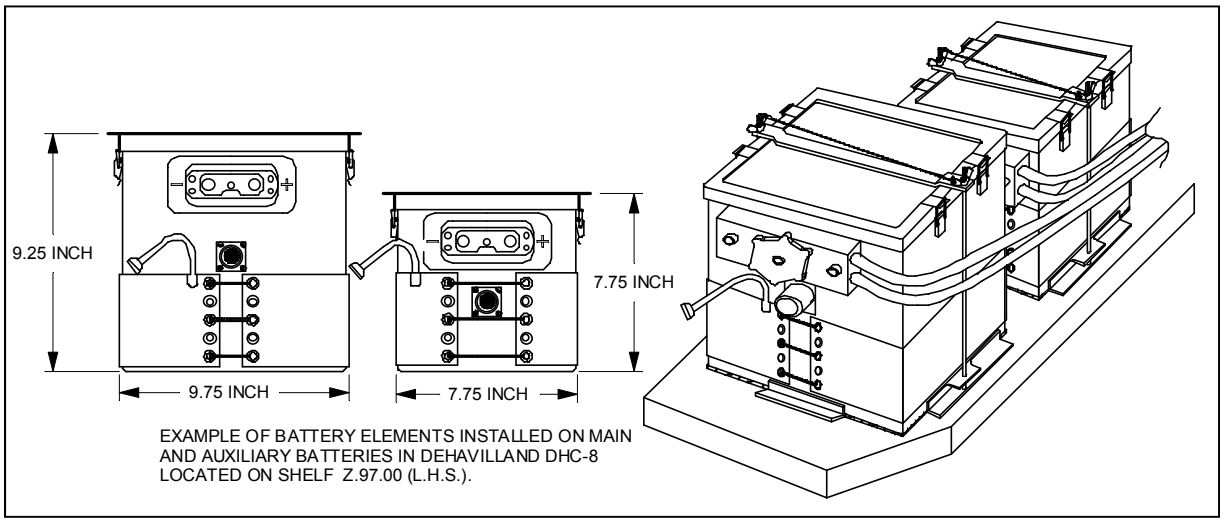

Figure 3 - Example of battery heat element installation. Ambient air thermal control (thermostat) is mounted in battery compartment 6-18 inches from the batteries.

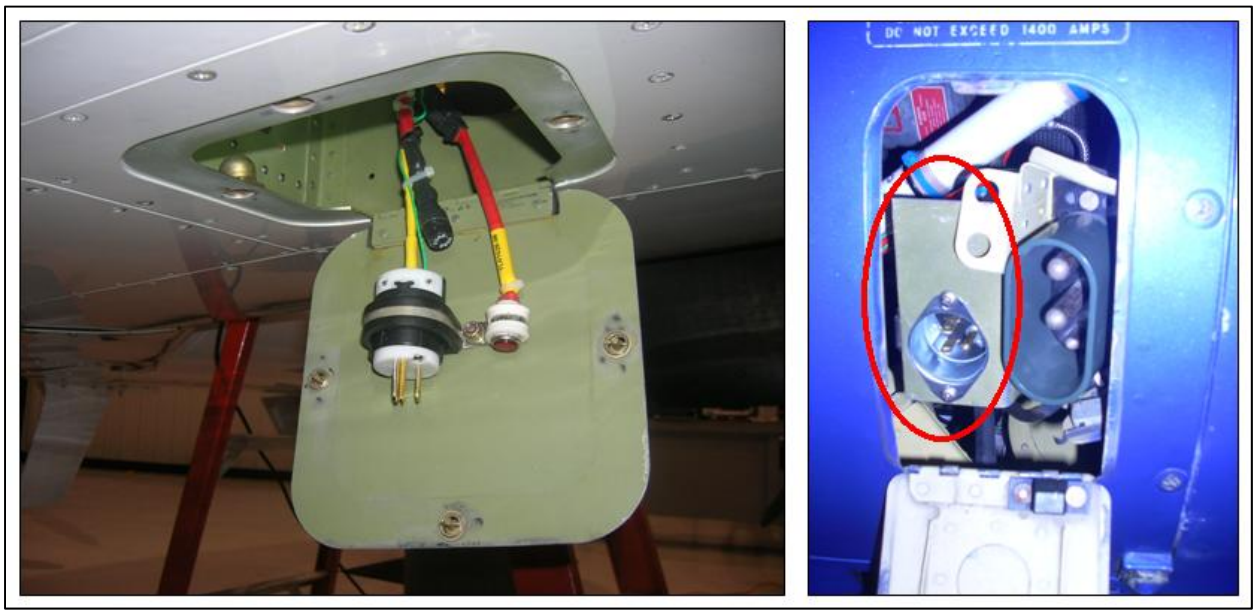

Figure 4 - Examples of plug mounting options, plug with clamp, and flush plug mounted in bracket accessible through existing DC access.

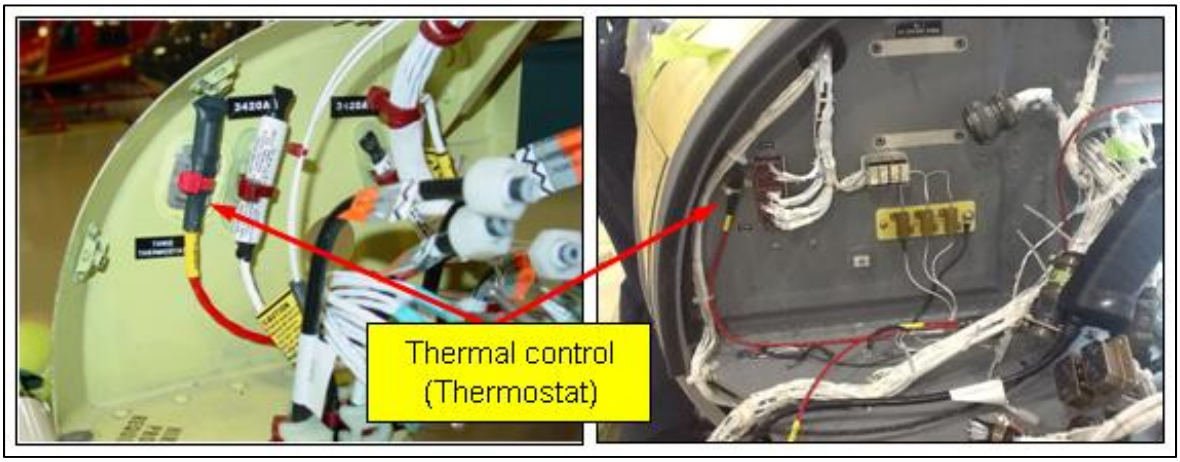

Figure 5 - Examples of thermal control mounted with cable mount in battery compartment 6 to 18 inches (15 to 46 cm) from battery heat element.

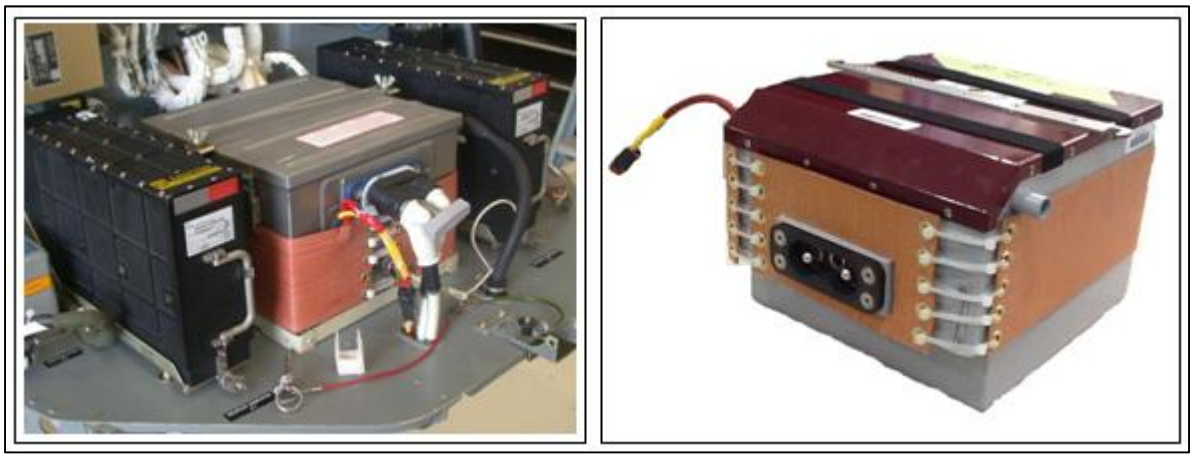

Figure 6 – Examples of battery heat element installations. **Left** - NiCad battery with element positioned to avoid battery contacts. **Right** - Concord RG-407/427 battery shown with element installed with adaptor panel modified/cut to fit around contact block. Position panel and element flat side to battery. Use cable-ties or appropriate lacing, and gently lace element in place alternating tension between grommets. While lacing, do not pull too hard this could result in pulling out grommets. Note: positing of panel in example shows cutout for contact block off centered in panel. Panel modification may vary by battery and/or other installation considerations.

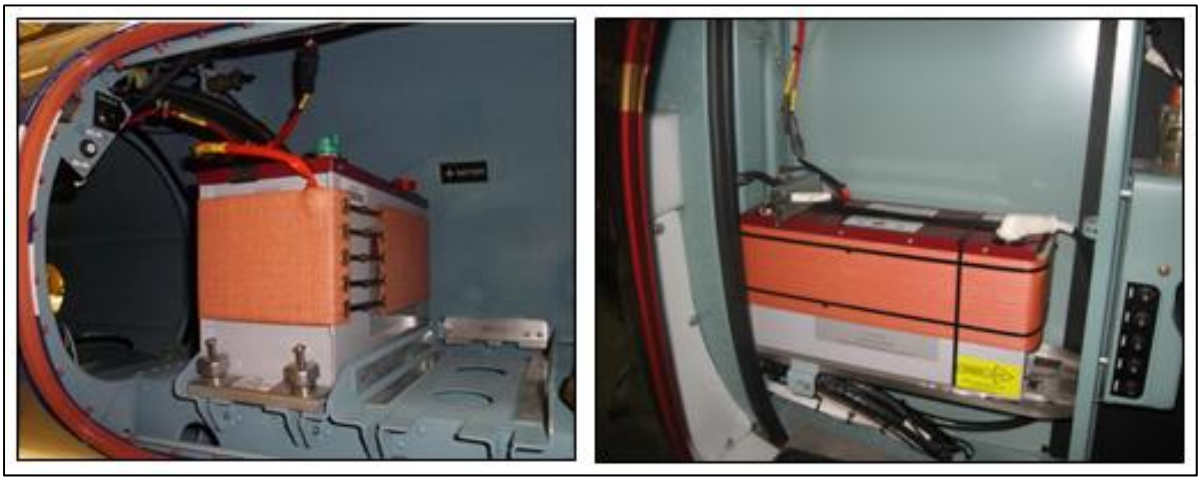

Figure 7 – Examples of batteries (RG350/RG355) with narrow 2647 elements positioned to avoid mounting brackets.

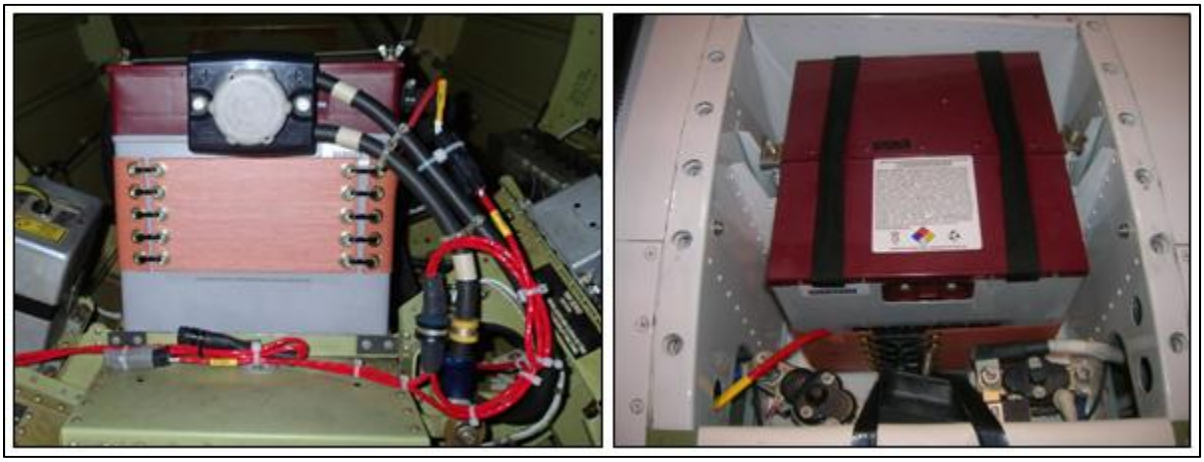

Figure 8 – Left – Adaptor panel installed extension, may be cut as needed.

Right – Battery installed on battery with limited space. When installing a battery with element in a battery box, a cardboard protector can be used to protect the element from sharp edges and aid in easing the battery into the box. Remove the cardboard once the battery is installed. Element and airframe may be protected from abrasion by applying Teflon tape to airframe in suspect areas.

6. FUNCTIONAL SYSTEM CHECK

Caution: Contact with hot element can cause 2nd degree burns.

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

Verify that 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, or test separately.

[√] Check the system as follows:

1) [ ] Verify system components are installed in accordance with kit installation instructions.
2) [ ] Verify effected component fluid levels are at operational levels.
3) [ ] Verify engine to airframe/engine bonding (ground strap) is as per OEM requirements.
4) [ ] Verify preheat system ground by checking for continuity between shore power plug ground, pin 3 (Figure 1), engine, and airframe.
5) [ ] Verify there is no continuity between shore power plug pins 1 and 2, and the ground pin 3.
6) [ ] Using an ohmmeter, measure resistance between the power pins 1 and 2, and record total system resistance: _____. Compare with Table 3.
7) [ ] * Freeze (0°C) battery thermal control and repeat step 6, record: _____.
8) [ ] Connect the system to appropriate power.
9) [ ] Verify power indicator light is on (illuminated).
10) [ ] Within 30-minutes, area adjacent to the elements will start to feel warm. Check each element individually.
11) [ ] When testing is completed, disconnect (unplug) from power, latch any access doors that were open, and stow extension cord in appropriate location.
12) [ ] Complete/fill-in blanks as indicated on first and last pages of Operating Guide listed in Table 1, and file with POH/RFM.
13) [ ] Complete/fill-in blanks as indicated in Instructions for Continued Airworthiness (ICA), and file with aircraft manuals and logs.
14) [ ] Update/modify weight and balance, and installed equipment lists (Section 3.5).
15) [ ] Make a log entry to comply with 14 CFR Part 43.9 or other procedures set in place.
16) [ ] Complete and return Registration/Warranty Card.
17) [ ] 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)