



**INSTRUCTION –  
HEATER INSTALLATION**

**Subject:** AV/Cabin Heat Kit p/n: TU03323

**Document No:** TN03323

**Revision:** B

**Date:** AUG-19-2021

**RECORD OF REVISIONS**

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

REV	DATE	DESCRIPTION	BY	CKD
B	AUG-19-2021	Add heater feet for occasional use configuration	DNE	GDO
A	FEB-05-2021	Initial Release	DNE	GDO

Current revision approval: \_\_\_\_\_

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**PROPRIETARY DATA**

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## 1. PURPOSE

This instruction provides guidance for installation of the Tanis AV/Cabin Heat Kit p/n: TU03323 and presents two types of installation, refer to §§ 4.1 and 4.2.

These Instructions may also supplement higher level kit instructions for installing THP3094 series AV/Cabin Heater.

Note: This instruction does not include installation procedures for required external power plug. Plug is supplied through engine or battery preheat kit or dedicated plug that is supplied and approved separate from this installation.

## 2. REQUIREMENTS

Subject kit Top-Level Drawing (TLD) 03323, parts and documents as listed.

- a. External power plug, tools, consumables, and extension cords not supplied w/ kit.
- b. Before starting installation calculate plug circuit load, existing preheat system + heater, not to exceed 15A refer to Figure 7.4.
- c. For acronyms, regulatory guidance, hardware, and material requirements, refer to Tanis Installation Guide: TNG1000.

## 3. DESCRIPTION

The kit includes the heater, adjustable thermostat, hardware, and required cabling/wiring. Heater is to be powered through an existing engine or battery preheat plug or dedicated plug that is supplied and approved separate from this installation.

Operated during cold weather the heater preconditions avionics reducing display panel malfunction, condensation, and cold weather induced gyroscopic errors. It also increases safety and ease of operations by helping to keep windows clear of frost, snow, and ice.

The heater itself is a compact 500W, forced air PTC space heater sized for compartment volume of 180 ft<sup>3</sup> / 5 m<sup>3</sup> (4 to 6 seat aircraft).

- a. Operable voltage range: 100-240 VAC.
- b. Current draw: 6A @ 100 VAC / 3A @ 240 VAC.
- c. Inrush: 115 VAC, 7.5A typical (9A below -10°C / 14°F)
- d. Cabin temperature-rise over ambient is typically in the range of 30-40°F (15-25°C).
- e. Additional descriptions below and in Section (§) 7 Figures 7.1 through 7.11.

## 4. INSTALLATION

**⚠ Caution:** Do Not use or locate in areas exposed to weather, fluids, or fuel vapors. Keep dry and free from Foreign Objects and Debris (FOD).

This instruction presents two types of installation, refer to §§ 4.1 and 4.2.

### 4.1 Occasional Use

Supplied Cabling and Thermostat are permanently installed, AV/Cabin Heater is configured for occasional using supplied Heater Feet. Configured w/ feet the heater is set feet down on the cabin floor for connected while on the ground. Before flight the heater is disconnected, connecting cable stowed/secured and heater stowed for removed from aircraft, refer to §§ 4.9 through 4.12 and Figures 7.12 and 7.13.

### 4.2 Permanent Installation

The heater is to be installed following procedures common to installation of radios, avionics equipment, and practices acceptable to the Administrator. Final determination for heater installation is to be determined (TBD) persons performing the installation.

Suggest using locations in the aircraft with known load carrying capabilities such as existing avionics mounting platforms, cabin side panels, firewall, bulkheads, or cockpit floor, providing they meet the strength requirements. Should the fabrication of additional support bracket and/or plate be required provide a mounting that will withstand the inertia forces. Refer to § 5 for structural considerations and § 7 for installation and mounting examples.

Refer to § 4.3 for additional regulatory support and current aircraft manufactures' s maintenance manual and/or ICA.

Classification of the modification may be considered a minor change pursuant 14 CFR §§ 21.93(a) and 21.319(a). It does not have an appreciable effect on weight, balance, structural strength, reliability, operation, or other characteristics affecting the airworthiness of the product (aircraft).

### 4.3 Regulations

Persons engaged in this alteration should be familiar w/ 14 CFR part 43 and part 65, subparts A, D, and E, applicable airworthiness requirements under which the aircraft was type certified, § 5 of this document, and the following:

AC 43.13-1 Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair (as amended) Ch 4 § 4 and/or Ch 3, for methods and techniques of retaining structural integrity and Ch 11 §§ 8 through 12 and 17, of this AC for electrical routing and securing, and feed-through penetrations.

AC 43.13-2 Acceptable Methods, Techniques, and Practices – Aircraft Alterations (as amended) Ch 1 for limit load factors, materials, workmanship, and fasteners, and Ch 2 §§ 202, 205, and 206, and Figures 2-1, 2-8, 2-9, and 2-10, for general, locating, fabrication, and reinforcement of supporting structure.

#### 4.4 Supporting Documents

Top-Level Drawing: 03323	ICA: TCA1000
Thermostat Instruction: TN03235	AC 43.13-1 (as amended)
Installation Guide: TNG1000	AC 43.13-2 (as amended)
Operating Guide: TPG1000	

#### 4.5 Materials

Substitution and/or additional materials used in association with this installation are to be of industry standard such as AN, NAS, ASTM, PMA, TSO, or MIL-SPEC, refer to § 5 of this document, AC 43.13-2B Ch 1 §§ 106 and 107.

Two forms of mounting hardware are supplied, 8-32 threaded fasteners and Dual Lock™ Strips refer to § 5.3. Examples of optional hardware refer to § 5.4.

#### 4.6 Inventory

Start with parts and document inventory, refer to TLD: 03323 for listing.

#### 4.7 Weight and Balance

Weigh kit and intended installation hardware before installation. Approximate installed weight of the heater kit as supplied: 1.5 lb (0.7 kg). For CG calculations use Station arm location as installed. For additional information on determining Wt & BI refer to Weight and Balance § of Installation Guide: TNG1000, AC 13.13-1B Ch 10, and FAA-H-8083-1.

#### 4.8 AV/Cabin Heater Installation

Select location for installing the heater in cabin, preferred location is below avionics panel and/or forward of occupants. Final location for heater installation is TBD by persons performing installation.

- Structure for mounting must be capable of supporting the load of the heater with required factor of safety, refer to §§ 5 and 7.
- Chosen location must allow for adequate ducting clearances and airflow, refer to § 7 Figures 7.2 and 7.3.
- Locate/mount heater on structure using supplied hardware or applicable alternates, §§ 4.5, 5.3 and 5.4.

#### 4.9 Thermostat Installation

Select location for the thermostat that is aft of and/or clear of heater outflow and in serviceable area that allows access for adjustment and inspection.

- Thermostat location TBD by user w/ reference to § 7 and Thermostat Instruction: TN03235.

#### 4.10 Cable Routing

Route cabling from power source/plug to heater. Locate CPD in serviceable area near plug, for circuit layout and limitations refer to Figure 7.4.

Note: When firewall penetration is required use existing and reseal accordingly following OEM procedures or refer to Appendix of TNG1000 for available options (TG01056, TU03125) or use OEM approved fitting.

#### 4.11 Placard

Affix placard in viewable area near power plug.

- a) When connecting with dedicated power plug affix supplied Placard p/n: TU03119-01 near plug or placard accordingly.
- b) If heater is installed as a subcomponent of engine preheat system using the same plug use existing placard.

#### 4.12 Completion

Inspect: Visually inspect and verify components are installed in accordance with this instruction, connected and secure.

Check: Plug heater into 100-240 VAC power source. Listen for audible fan and then check for warm air circulation. If required turn thermostat to set point above ambient temperature to verify operation. When test is complete reset to desired set point, suggested set point in the range of 15 to 20°C (60 to 68°F).

Record: Pursuant 14 CFR part 43.9, and/or other procedures set in place record installation.

- a) Wt & BI and equipment list, amend as required under aircraft type certificate.
- b) Record and Retain Data as indicated in ICA: TCA1000 and Operating Guide: TPG1000.
- c) Complete Registration/Warranty Card, go to: <https://www.tanisaircraft.com/warranty-card-registration>

## 5. STRUCTURAL CONSIDERATIONS

Examples in this section outline basic load factors and hardware considerations for the installation of the heater.

Heater is relatively light and loaded by aircraft inertial loads. Due to robust nature of the heater, hardware, and surrounding structure of a typical aircraft cabin, inertial loads of the heater are normally found to be ancillary to the installation, refer to §§ 5.2, 5.3, and 5.4.

Summary: MS in this section have been calculated using Load Factor requirements from Table 5.2. and have been found to be High.

Note:

Margin of Safety = Allowable Stress (or load) / Actual Stress (or load) – 1.

Adequate is a positive margin of safety based on inspection and does not have a calculated margin of safety.

High is a calculated MS that is greater than one.

### 5.1 Inertia Loads

Each occupant and item of mass inside the cabin that could injure an occupant is to be restrained when subjected to the following ultimate inertial load factors relative to the surrounding structure.

**Table 5.1** Limit Load Factors (Excerpt from AC 43.13-2B Table 1-1)

Direction of Force Applied:	Acrobatic Occupant 14 CFR part 23 (CAR 3)	Airplane Occupant Items of Mass within the cabin 14 CFR part 23.561 (CAR 3)	Rotorcraft Occupant Items of Mass within the cabin 14 CFR part 27.561 (CAR 6)
Sideward	1.5g	4.5g	8.0g
Upward	4.5g	3.0g	4.0g
Forward	9.0g	18.0g	16.0g
Downward	9.0g	---	<b>20.0g</b>
Rearward	---	---	1.5g

\*\* In lieu of specific information, the factor used for part 23 utility category are acceptable for aircraft that never exceed speed of 250 knots and the factors used for part 23 acrobatic category.

**Table 5.2** Sample Load Factors (LF)

Highest Load Factors from Table 6.1 above:	LF X 1.5 lb (heater wt.)
Sideward 8.0g	12.0 pounds
Upward 4.0g	6.0 pounds
Forward 18.0g	27.0 pounds
Downward <b>20.0g</b>	<b>30.0</b> pounds
Rearward 1.5g	2.25 pounds

## 5.2 Actual Load

Installed weight of heater and hardware, 1.5-lbs. Estimated mounting structure capacity 80 lb.

Example: Calculation using Highest LF of 30.0 lb refer to Table 5.2.

$$MS = \frac{80}{30} - 1.0 = +1.66 \quad \underline{+1.6}$$

## 5.3 Supplied Mounting Hardware Capability:

Fasteners conform to accepted standards, refer to § 4.3, TNG1000 and AC 13.13-2 Ch 1 § 108.

Examples below are for supplied mounting options:

8-32 alloy steel cadmium screws 4-each. Shear per screw: 380 lb x 4 = 1,520 lb.

$$MS = \frac{1520}{30} - 1 = +49.66 \quad \underline{+49.6}$$

Dual Lock™ Strips p/n: TU03239-02 4-sets (each set 2-square inches). Shear per set: 140 lb x 4 = 560 lb.

$$MS = \frac{560}{30} - 1 = +17.66 \quad \underline{+17.6}$$

## 5.4 Examples of Optional Mounting Hardware Capability:

Alternates are not limited to examples below, for fasteners standards refer to § 4.3.

Stud Mount Kit p/n: TU03262 4-each (ASTM CB4000E3CR series Click Bond and CB200 acrylic structural adhesive).

Stud shear strength (10-32 304 stainless) each 400 lbs x 4 = 1,600 lbs.

$$MS = \frac{1600}{30} - 1 = +52.33 \quad \underline{+52.3}$$

Adhesive shear strength 4,400 psi. Stud base mount area 0.875 in<sup>2</sup> x 4,400 = 3,850 lb.

$$MS = \frac{3850}{30} - 1 = +127.33 \quad \underline{+127.3}$$

MS21059-08 8-32 Nut Plate, 4-each.

Axle strength each nut plate 1720 lbs x 4 = 6880 lb.

$$MS = \frac{6880}{30} - 1 = +228.33 \quad \underline{+228.3}$$

MS20470AD-3 (2117-T) rivet, 8-each used to attach MS21059 nut plates.

Shear strength each 210 lb, lbs x 8 = 1736 lb.

$$MS = \frac{1680}{30} - 1 = +55.0 \quad \underline{+55.0}$$

CR3212-4 rivet 10-each used to attach mounting plate or bracket.

Shear strength each 615 lb. x 10 = 6150

$$MS = \frac{6150}{30} = +204.0 \quad \underline{+204.0}$$

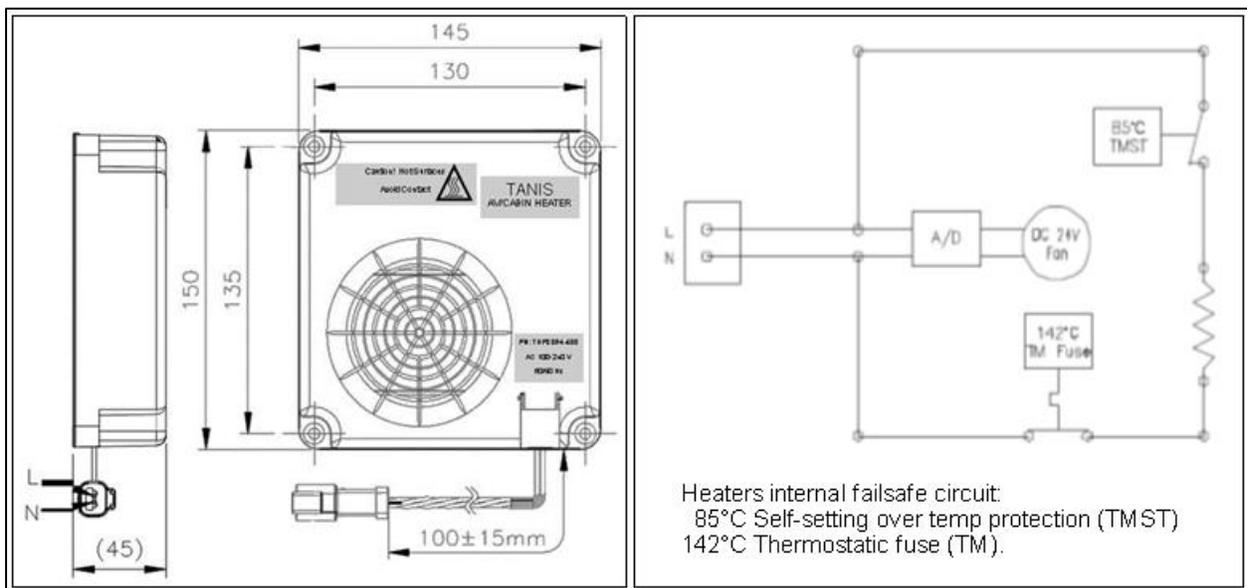
## 6. MAINTENANCE AND SERVICE

⚠ **Do Not** open-up or modify heater. There are no authorized repair procedures. Should a malfunction be detected, disconnect heater from power and refer to ICA: TCA1000 and/or contact Tanis engineering.

- Keep heater dry and free from Foreign Objects and Debris (FOD).
- Annually inspect security of attachment, check air intake and outlet ports for FOD and obstructions and verify operation.

## 7. INSTALLATION FIGURES

Examples in this section are for reference. Actual configuration and installations may vary by application and/or kit specific instruction.



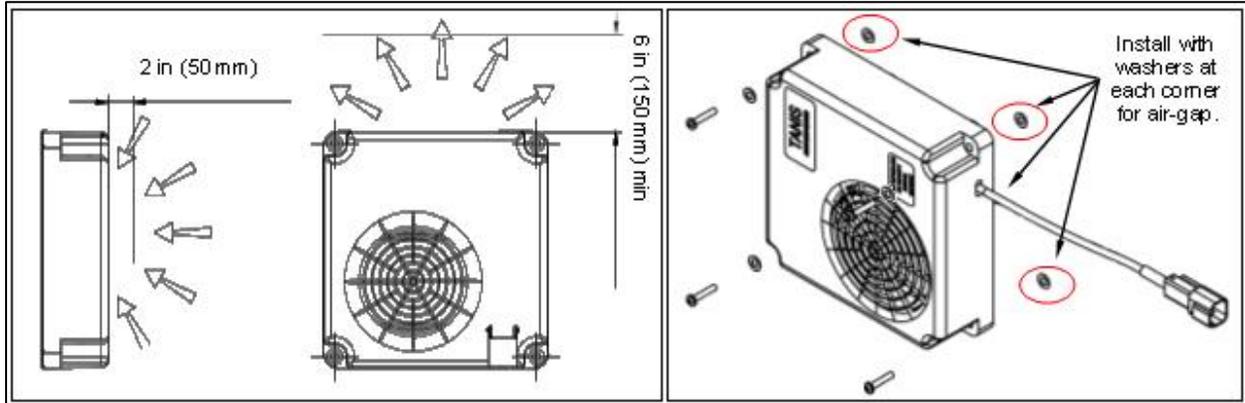
**Figure 7.1.** Heater dimensions and internal failsafe circuit. For additional heater ratings refer to Instruction: TN03094, available online: <https://www.tanisaircraft.com/technical-data> or by contacting Tanis Aircraft Products directly.

Heater is installed using all 4-mounting tabs and supplied hardware or alternates, § 4.5, 5.3, and 5.4.

Tab spacing: 5-1/8 x 5-5/16 inches (130 x 135 mm).

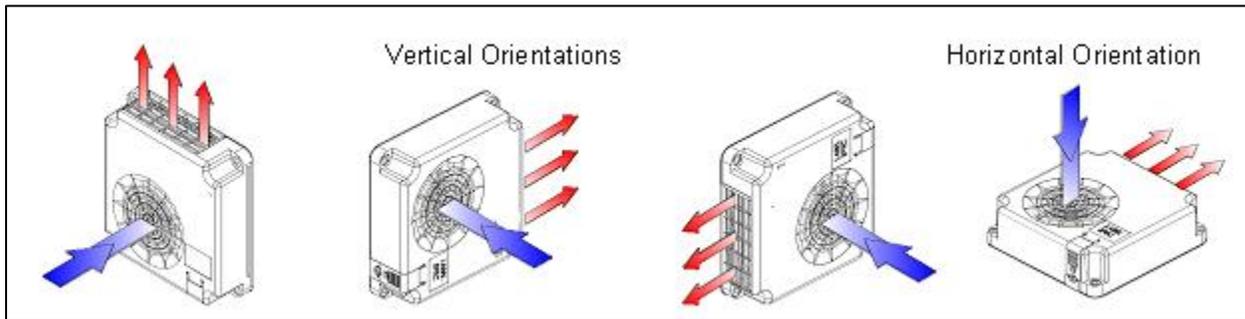
Outline dimensions: 6 x 5-3/4 x 2-inches (150 x 145 x 45 mm).

Weight: 1.3 lb (0.6 Kg) approximate.

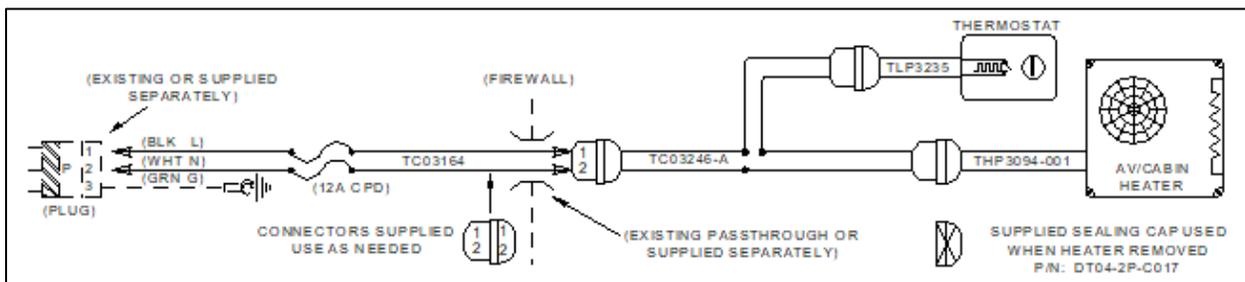


**Figure 7.2.** Ducting clearances: To avoid warm air standstill and overheating maintain minimum clearances or greater. Recommend outflow clearance of more than 12-inches when outflow is aimed at avionics.

**Note:** Requires 0.032-inch (0.8 mm) minimum airgap between heater and mounting surface.



**Figure 7.3.** Mounting orientations with ducting flow. To avoid warm air standstill, overheating of heater and/or items near outflow, maintain minimum clearances, 2-inches inlet and 6-inches outflow, or greater refer to Figure 7.2.



**Figure 7.4.** Heater circuit layout. Operable voltage 100-240VAC. Circuit: CPD not to exceed 12A, load not to exceed 10A. Total plug load not to exceed 15A (total of circuits powered through plug, i.e., existing preheat + AV/Cabin Heater).

For additional circuit loads limitations and options refer to drawings: 03320 and 03322.

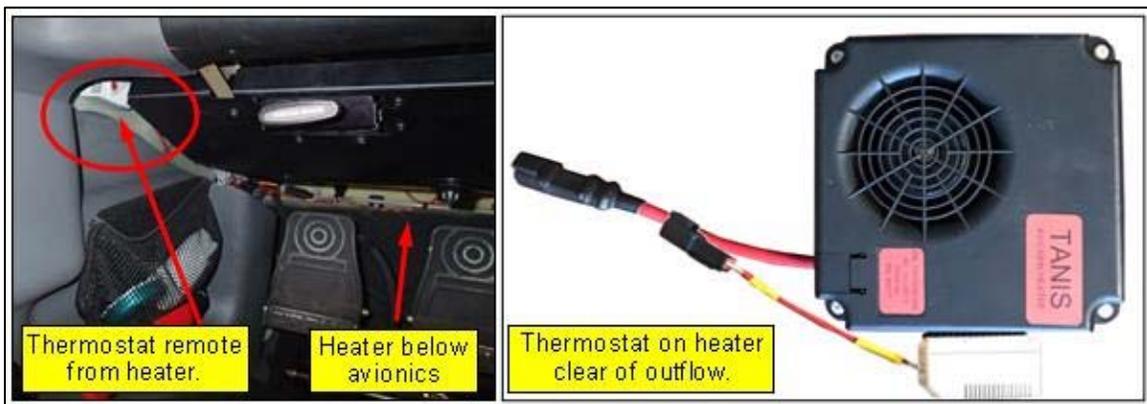
Note: When firewall penetration is required use existing and reseal accordingly following OEM procedures or refer to Appendix of TNG1000 for available options (TG01056, TU03125) or use OEM approved fitting.



**Figure 7.5.** Examples of AV heater installations.

Left: Airvan GA8, existing avionics plate w/ MS21059-08 floating nuts (supplied separately) thermostat located on side of heater opposite of outflow, Instruction: TN03235.

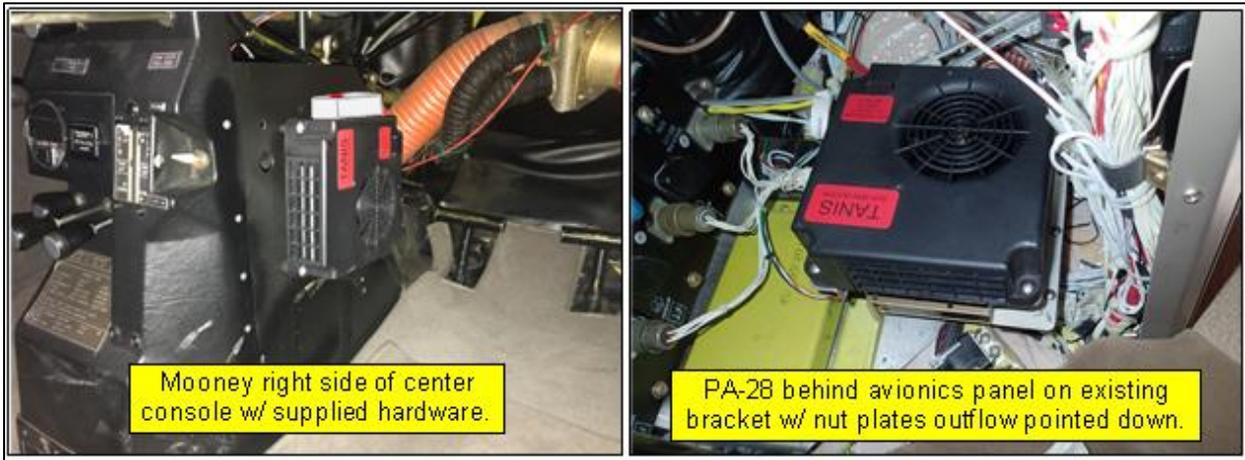
Right: Kodiak 100, firewall w/ supplied 8-32 hardware.



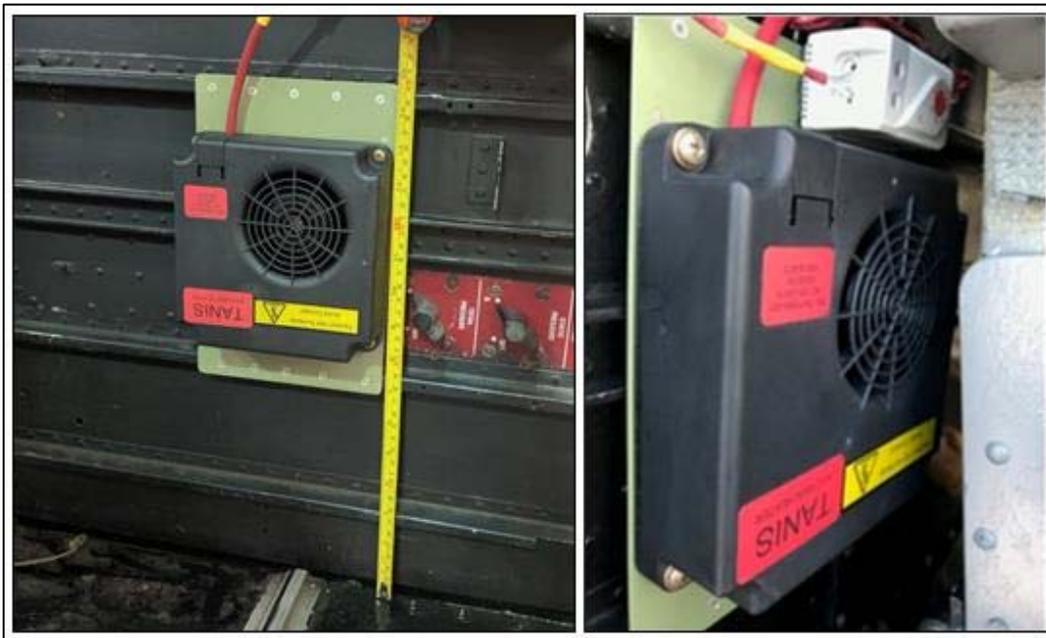
**Figure 7.6.** Example of heater mounted below avionics panel on lower kick plate, thermostat on quarter panel or locate on side of heater clear/aft of outflow, refer to Thermostat Instruction: TN03235.



**Figure 7.7.** PA-28 example w/ heater on sidewall below door sill. Installation used existing firewall passthrough for cabling routing from engine preheat power plug. Thermostat remotely located under avionics panel, refer to instruction TN03235.



**Figure 7.8.** Example of heater mounting in Mooney and Piper. Installation used existing firewall passthrough for cabling routing from engine preheat power plug.



**Figure 7.9.** Helicopter installation, example w/ heater located on bulkhead with field fabricated mounting plate/bracket drawing 03331. Riveted to longerons with CR3212-4 blind rivets. Thermostat mounted on plate above heater, refer to instruction TN03235.



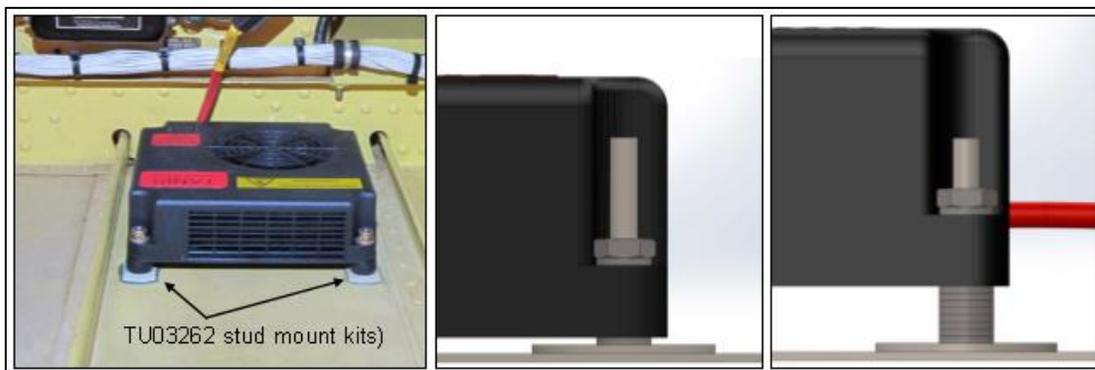
**Figure 7.10.** Example of heater mounted w/ supplied Dual Lock™ Strips p/n: TU03239-02.

Surface preparation: Lightly abrade glossy surfaces with scotch bright to improve the adhesive bond. Just prior to locating strips clean contact surfaces of mounting site and heater with Solvent Wipe p/n: CB911, rubbing alcohol, or heptane. To prevent redistribution of contaminants, dry with a clean dry cloth before solvent evaporates.

**Do Not** use shop towel, rags or paper wipes contaminated with oil, soap, or reclaimed solvents.

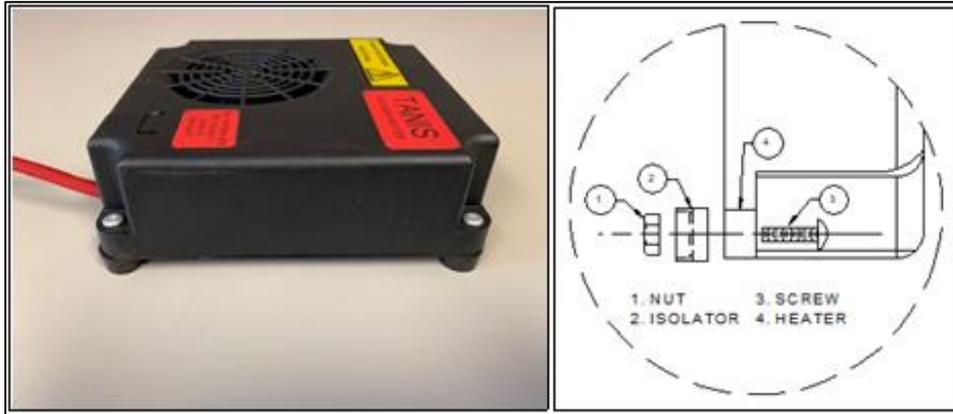
Without touching adhesive remove liner from strip adhesive and firmly press strip in place. To insure 100% of adhesive strip is in contact, especially around perimeter, press in place with down force pressure of 5 to 10 lbs. Be sure not to damage re-closable fastener stems.

For additional application procedures refer to 3M Dual Lock™ Application Guide.

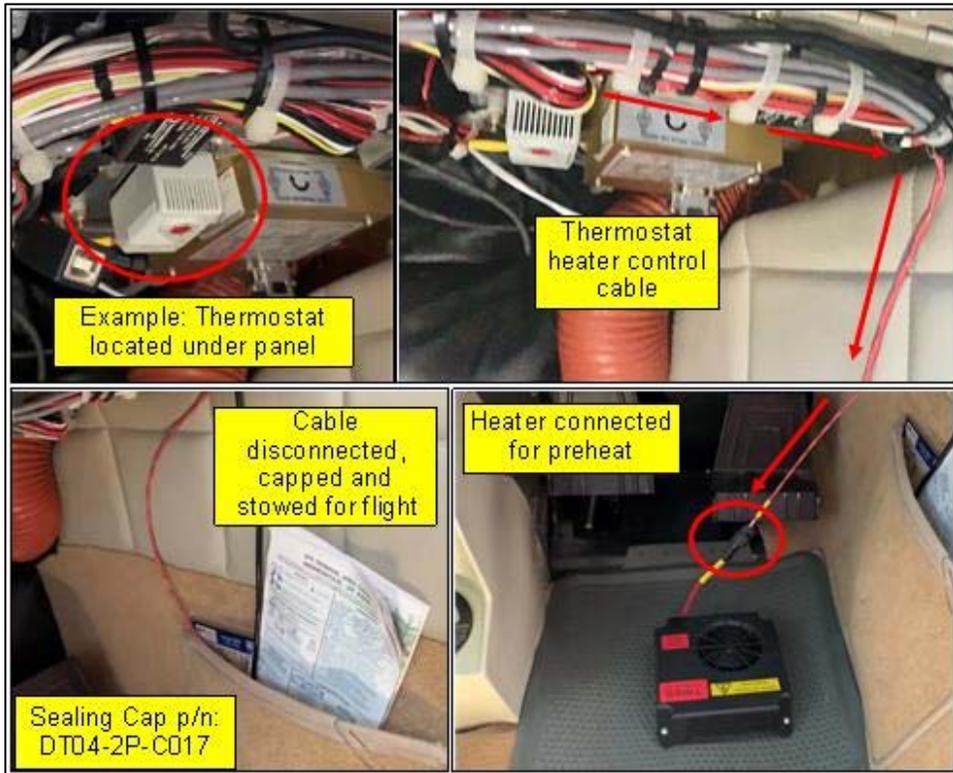


**Figure 7.11.** Example of heater located w/ optional Stud Mount Kits p/n: TU03262 (4-each supplied separately). Use additional spacers and/or washer as required.

Stud Mount Kits include one stud mount, lock nut, and 2-flat washers. Requires Adhesive Mix Kit p/n: CB92 (1-kit per 4-stud mounts) or CB200 acrylic adhesive, refer Click Bond™ Data Sheet: CB200 for site preparation and adhesive application.



**Figure 7.12.** Example of heater configured for Occasional use w/ supplied 4-pack of Heater Feet p/n: TU03344. Feet are only used on heater configured for Occasional use. DO NOT use as spacers when mounting heater.



**Figure 7.13.** Example Occasional use heater. Cabling and thermostat permanently installed with lead for heater positioned clear of controls for connection with heater during preheat. Refer to Thermostat Instruction: TN03235, §§ 4.9 and 4.10.

When placing the heater for use, allow for adequate ducting clearances and airflow, refer to § 7 Figures 7.2 and 7.3.

When heater is disconnected cap aircraft lead with supplied Sealing Cap (gray) p/n: DT04-2P-C017 refer to Figure 7.4.

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