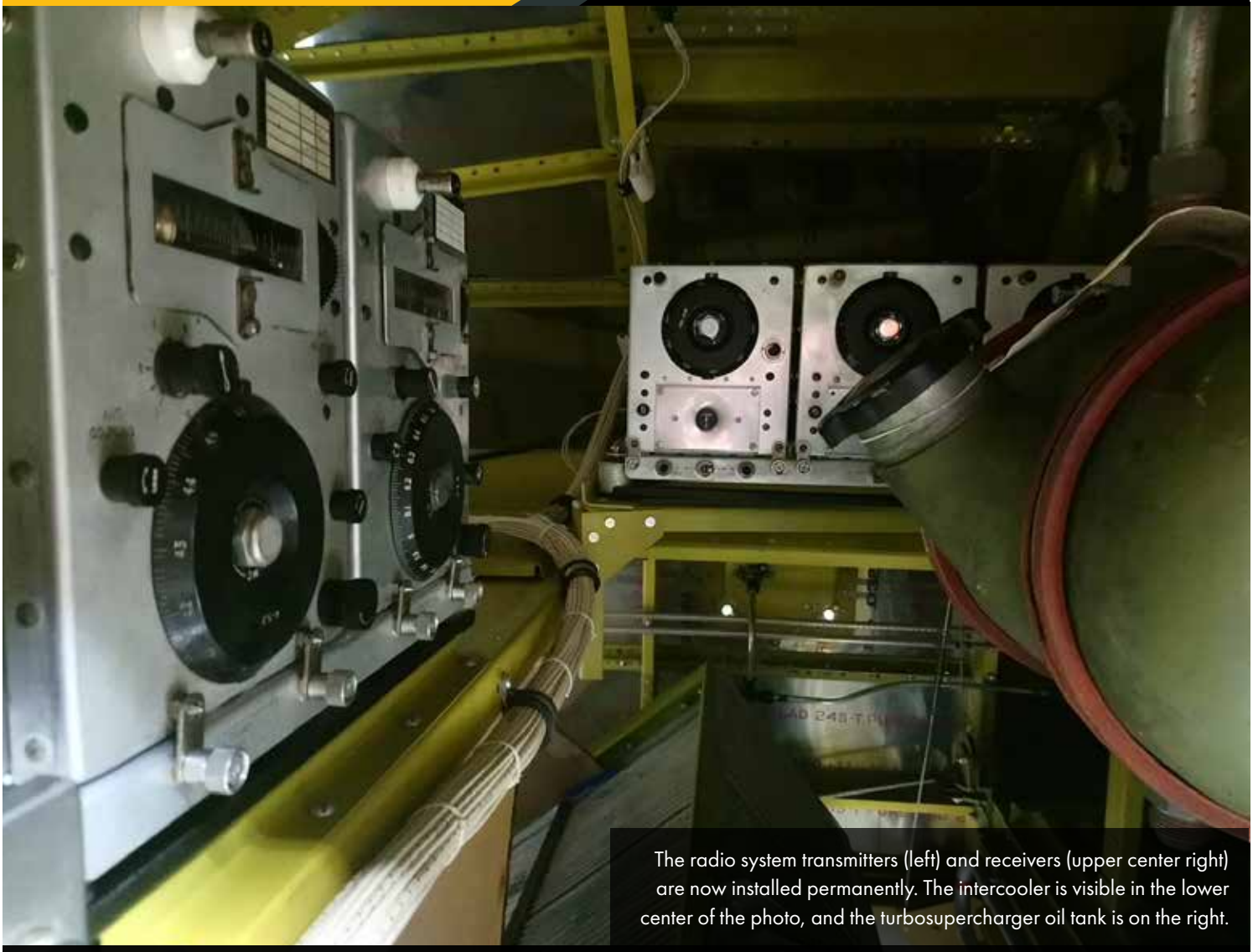
JAN/FEB

Dakota Territory Air Museum's P-47 Update

by Chuck Cravens

AIRCORPS AVIATION



The radio system transmitters (left) and receivers (upper center right) are now installed permanently. The intercooler is visible in the lower center of the photo, and the turbosupercharger oil tank is on the right.

DAKOTA TERRITORY AIR MUSEUM

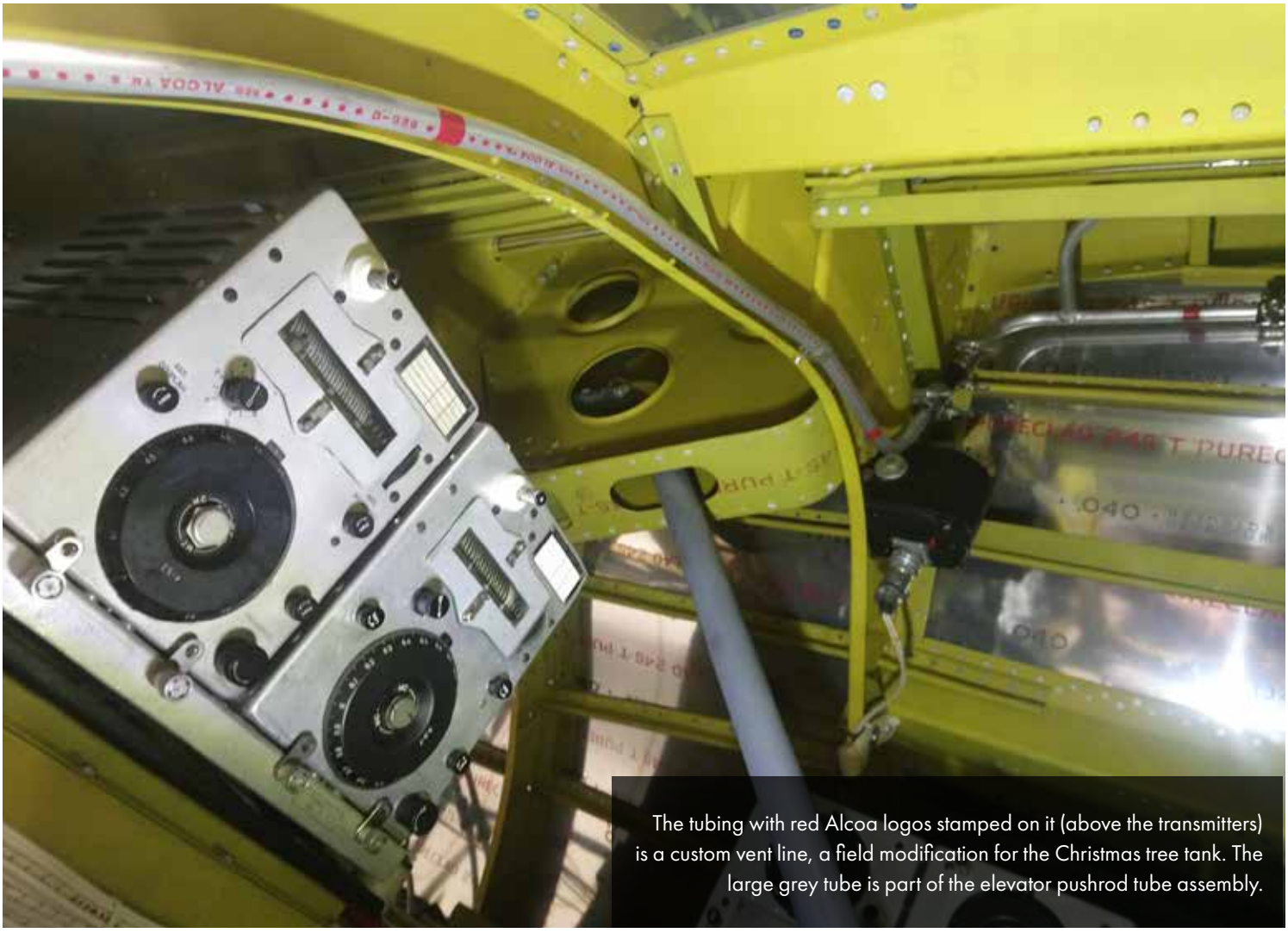
Update

This month Aaron worked on finishing the various custom drain and vent lines unique to the Christmas tree tank equipped P-47s. Work also continued on the systems inside the wings. The fitted skins were removed to prepare for permanent riveting.

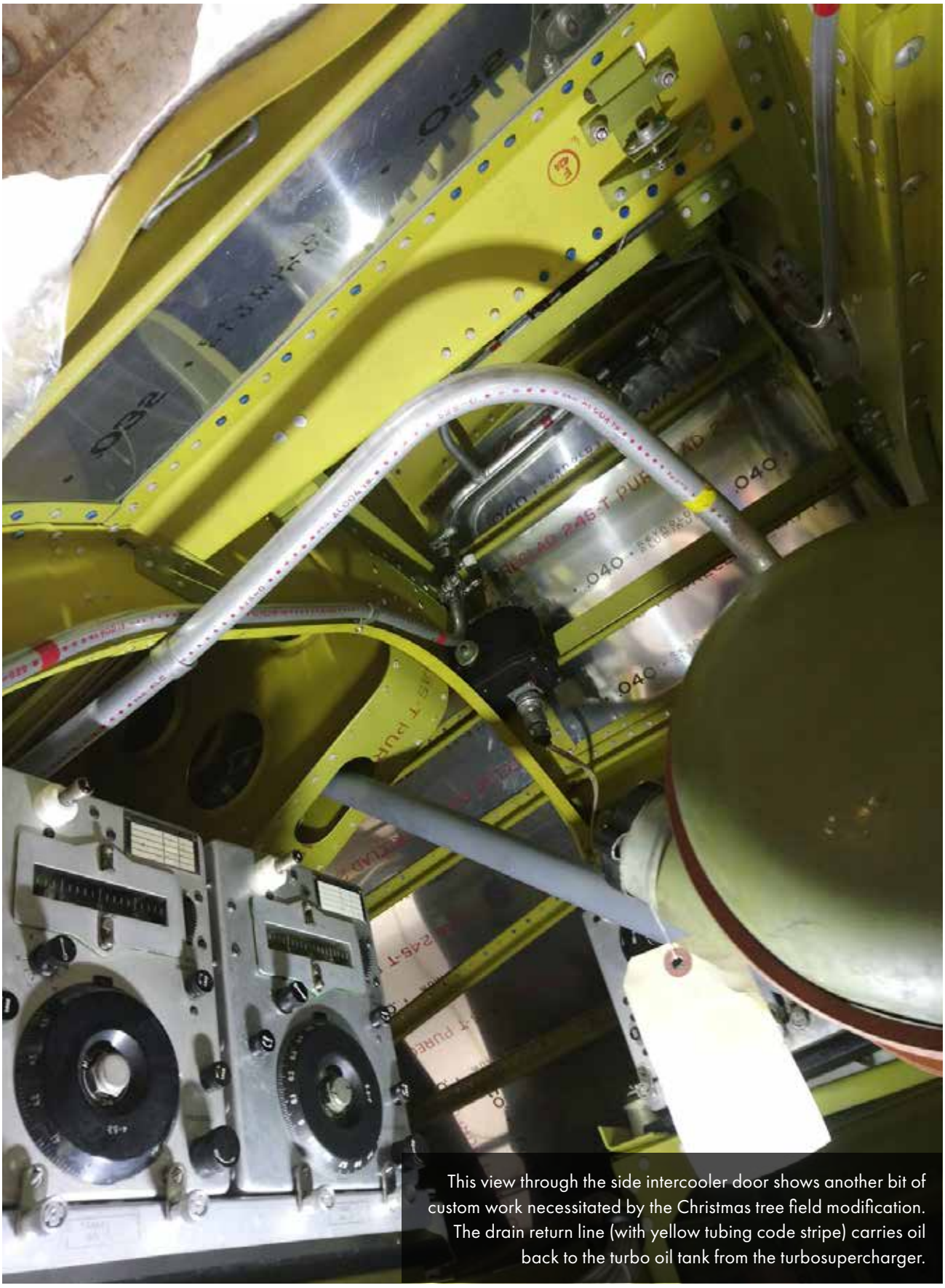
Finally, we'll look into a few features of the P-47's that are pretty unique to the big fighter.

Fuselage

Aaron has finished the main installation of the radio system. He continues work on wiring and hydraulic systems, including some custom routing of tubing for the Christmas tree tank. Another system he is installing is the oil cooling control system.

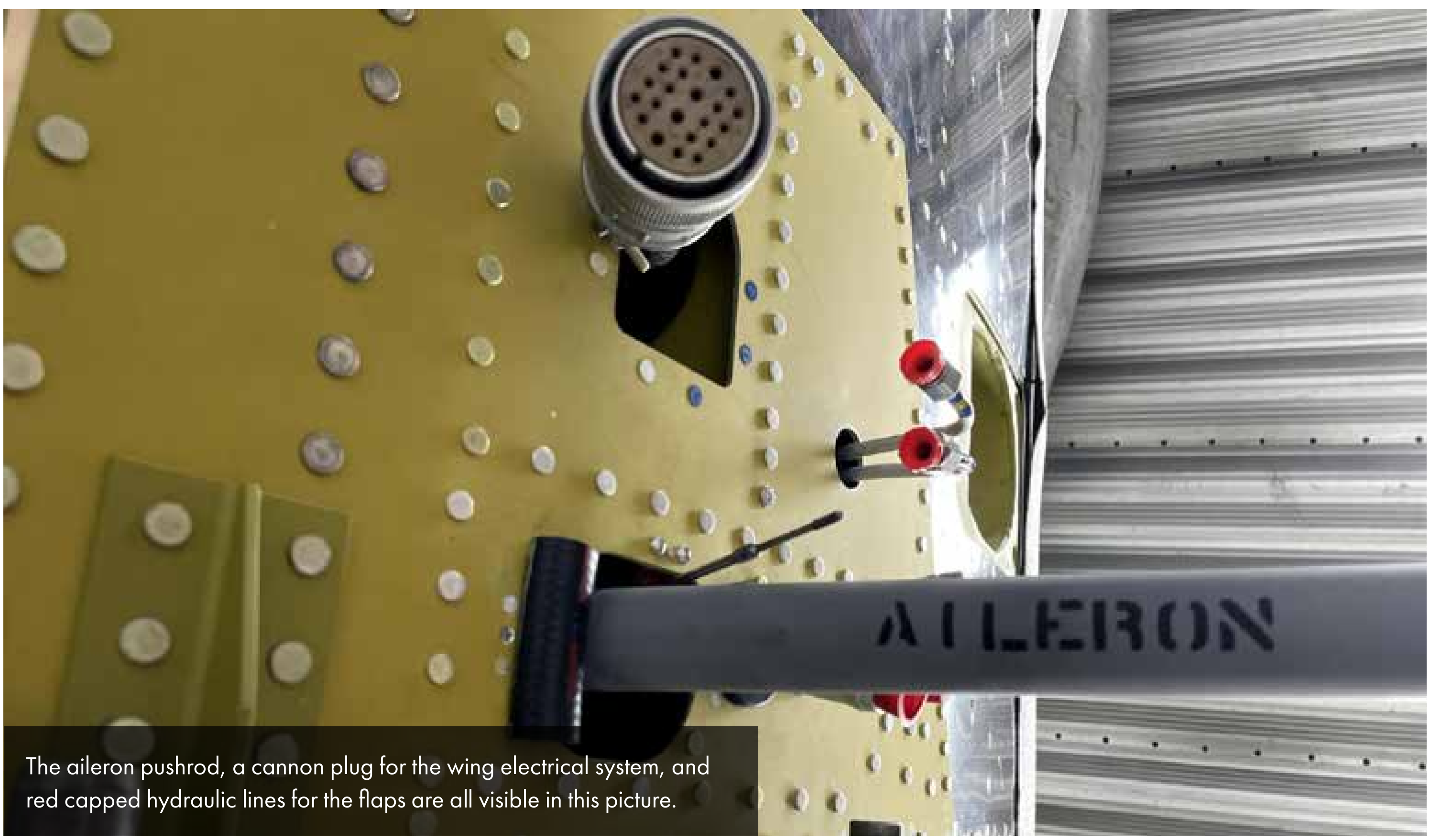


The tubing with red Alcoa logos stamped on it (above the transmitters) is a custom vent line, a field modification for the Christmas tree tank. The large grey tube is part of the elevator pushrod tube assembly.



This view through the side intercooler door shows another bit of custom work necessitated by the Christmas tree field modification. The drain return line (with yellow tubing code stripe) carries oil back to the turbo oil tank from the turbosupercharger.

The red marked tubing is another custom installation. It is the Christmas tree tank vent line assembly.



The aileron pushrod, a cannon plug for the wing electrical system, and red capped hydraulic lines for the flaps are all visible in this picture.

Wing

Whenever aluminum skin sections are made and eventually riveted on, they must be fitted, drilled, removed, holes deburred and sometimes chamfered, and finally refitted and riveted in place permanently. This month the skins are mostly off and are gradually being riveted in place permanently.

The wings look less complete than last month. That's because the skins that were clecoed on for fitting have been removed for final chamfering of the rivet holes in preparation for being permanently riveted on.

The right wing is at the same stage as the left.

Extrusions that are used for the wing stringers lay on the bench.

One of the outer wing skins is positioned for riveting to the top of the right wing.

Skin sections on the bottom of the left wing are also positioned for permanent riveting.

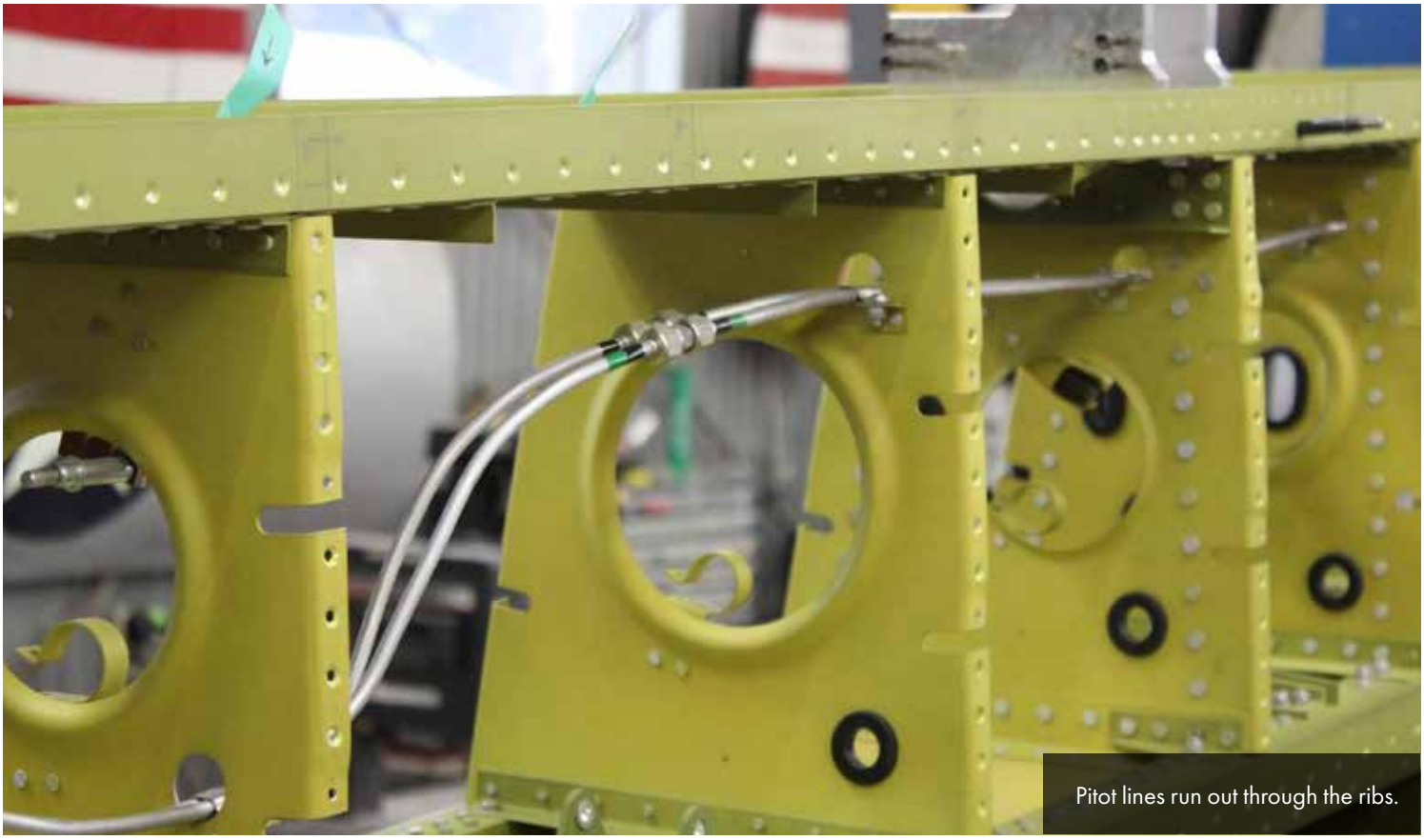
Some of the many access doors and reinforcing plates await installation.

The gun bay door locking handles occupy the center of this photo.

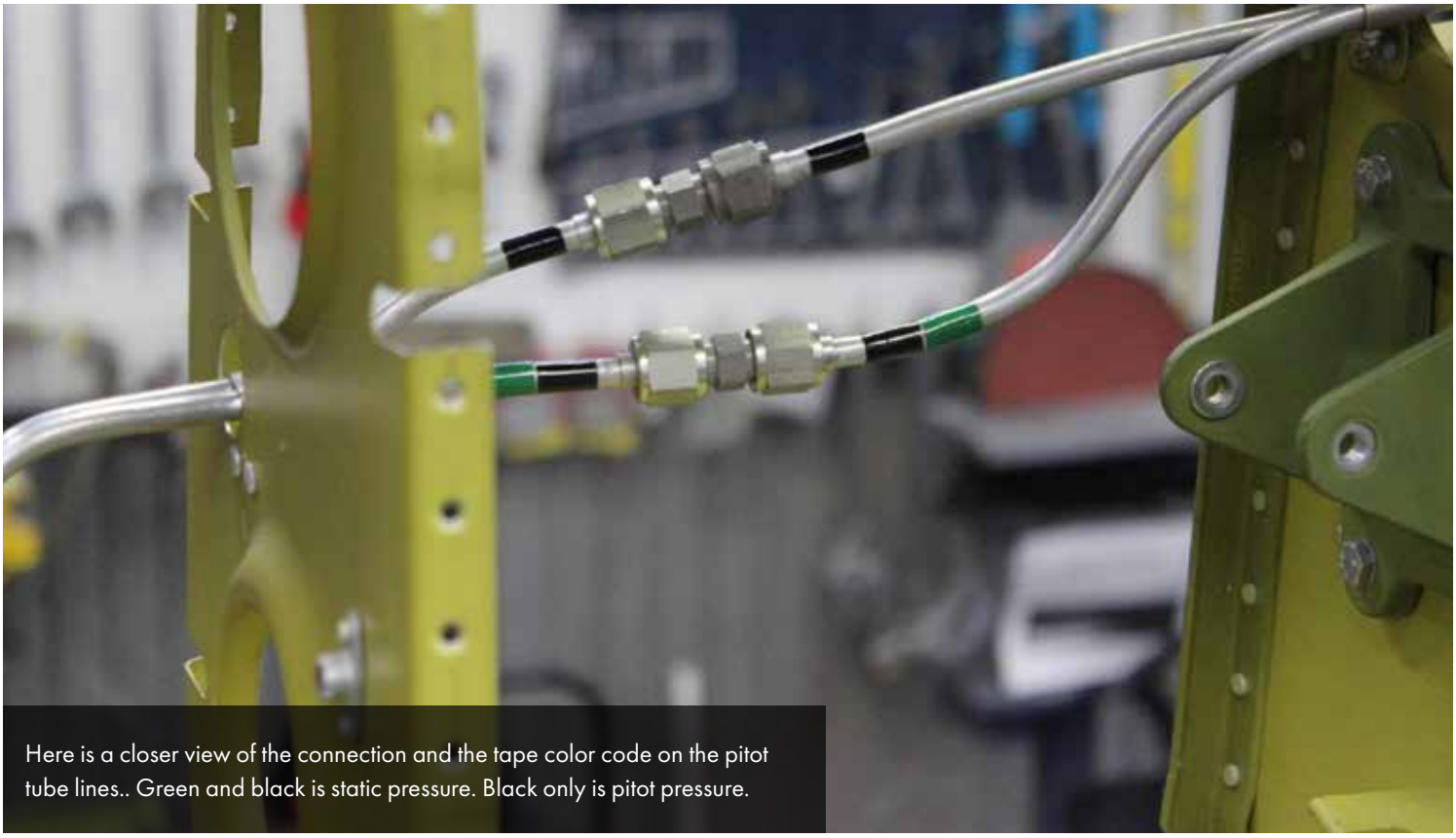
Access doors sit stacked upon one another on the bench.

Grommets to protect electrical wire bundles are in place in the wing ribs.

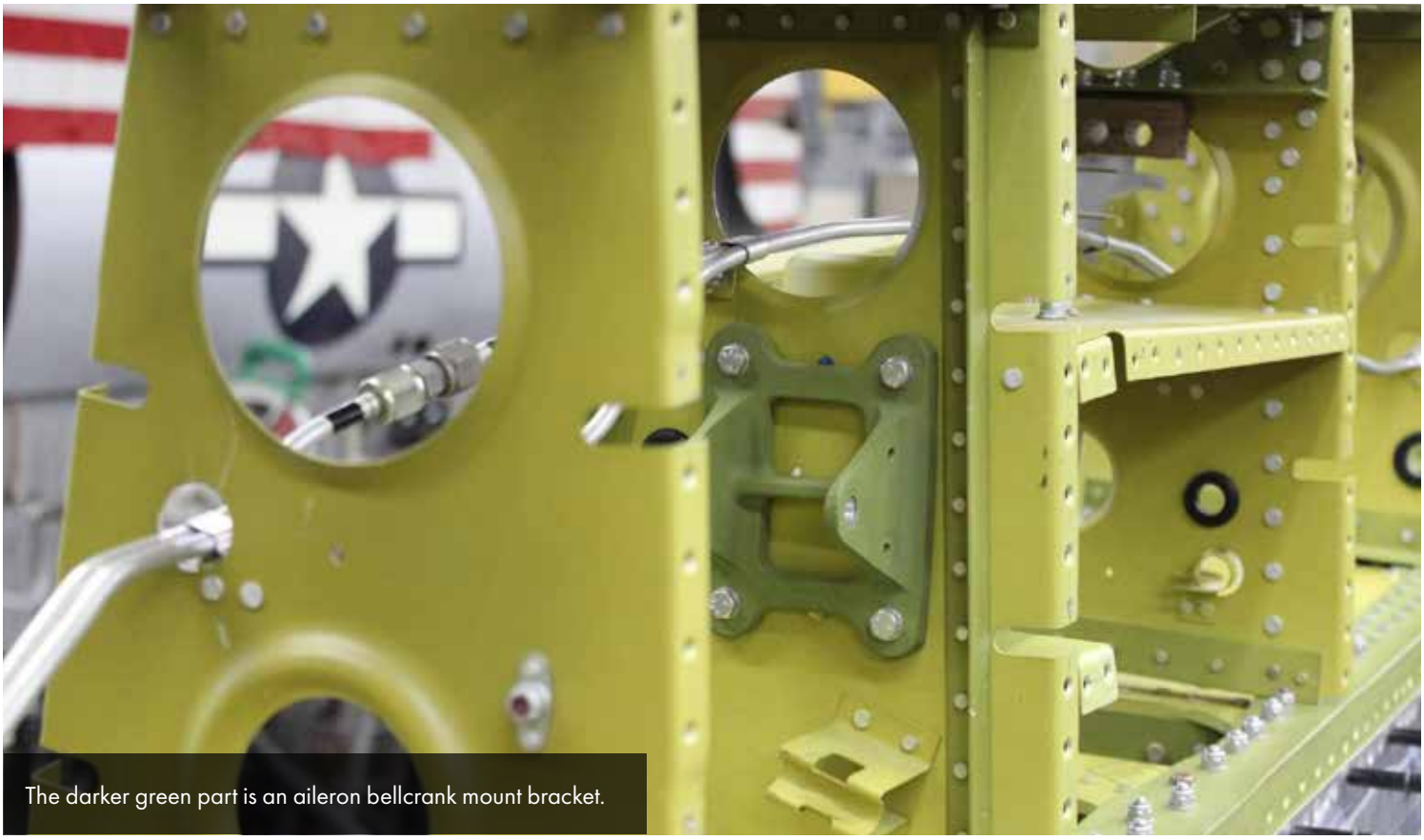
Here is a close up of a single electrical line grommet.



Pitot lines run out through the ribs.



Here is a closer view of the connection and the tape color code on the pitot tube lines.. Green and black is static pressure. Black only is pitot pressure.



The darker green part is an aileron bellcrank mount bracket.

The Alcoa logo that was used in the 40's is reproduced on the new pitot lines with ink rollers specially made for this purpose. All hydraulic, pitot, and fuel lines on this P-47 carry the correct historically accurate logos.

This is a mid wing junction block. Wiring for pitot heat, the outer position light, and one solenoid wire for number 3 and 4 (outer) guns connect here.

Some Unique P-47 Features

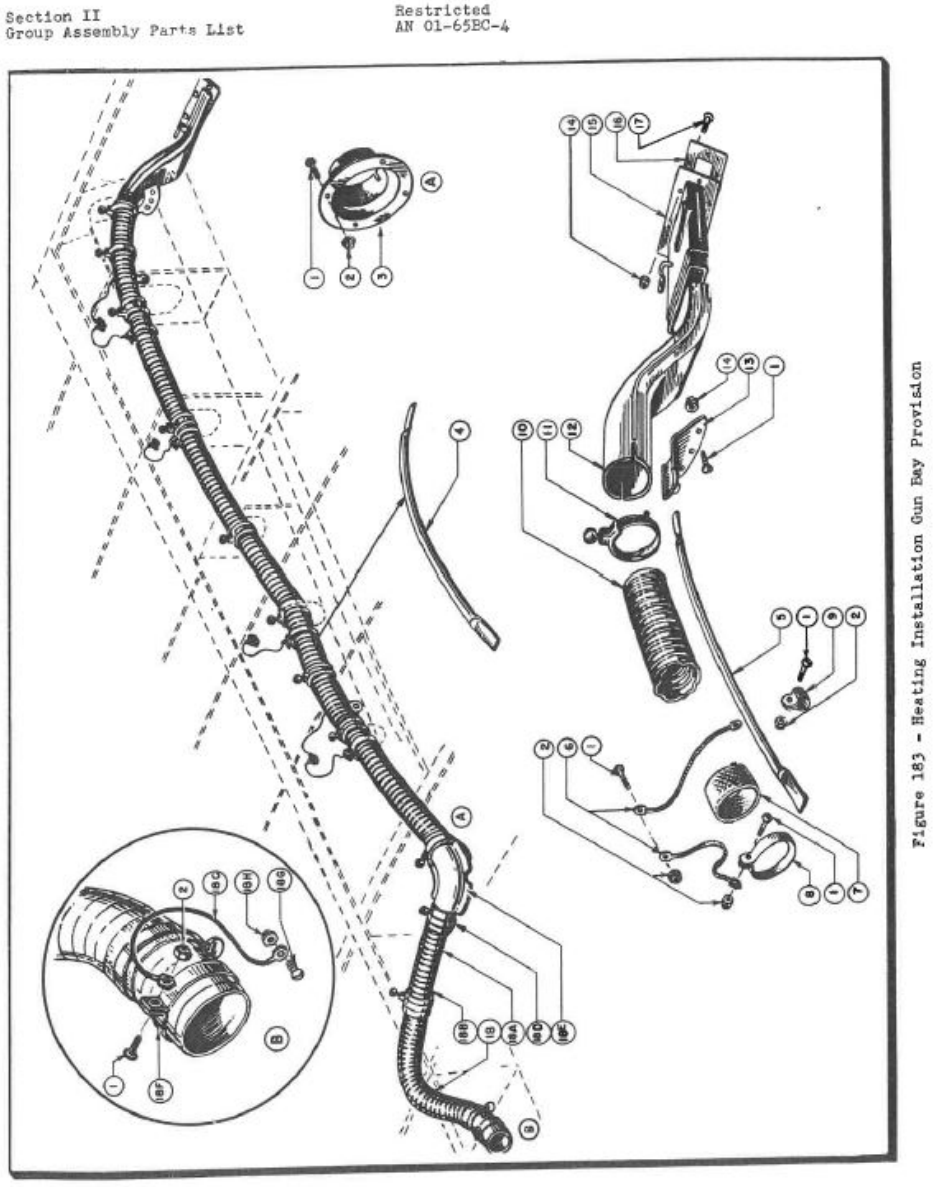
One of the problems engineers had to solve for high altitude fighters like the P-47 was a tendency for guns to become inoperative in the cold air at high altitudes. Lubricants became too thick, any moisture present would freeze; and the result was guns that didn't fire or fired unreliably. To solve cold related problems the answer is, of course, heat.

The turbosupercharger system made heating the guns with hot air tapped from the exhaust a relatively simple engineering solution.

The *Erection and Maintenance Instructions for P-47 Aircraft*, page 351 describes the system and the changes that were made as later series Thunderbolts evolved:

"1) The gun bay is heated by hot air tapped off the exhaust manifold tail pipe shrouds at a point just forward of spar 2 of the wings. The air is carried through metal ducts to the gun bay. Systems independent, except for the control knob, are used for each side of the airplane.

2) Flow of this hot air is controlled by a damper in each duct, located at the point where air is taken from the exhaust shrouds. These dampers extend into the shrouds when open and act as scoops to aid the pressure differential which prevails during flight in maintaining a flow from the shrouds to the gun bays. These dampers are normally open and held by spring pressure. They can be closed and locked by means of tension cables working in flexible casings which run to a control knob located near the trim tab control at the left side of the cockpit. This knob is pulled and turned clockwise to lock the dampers closed.

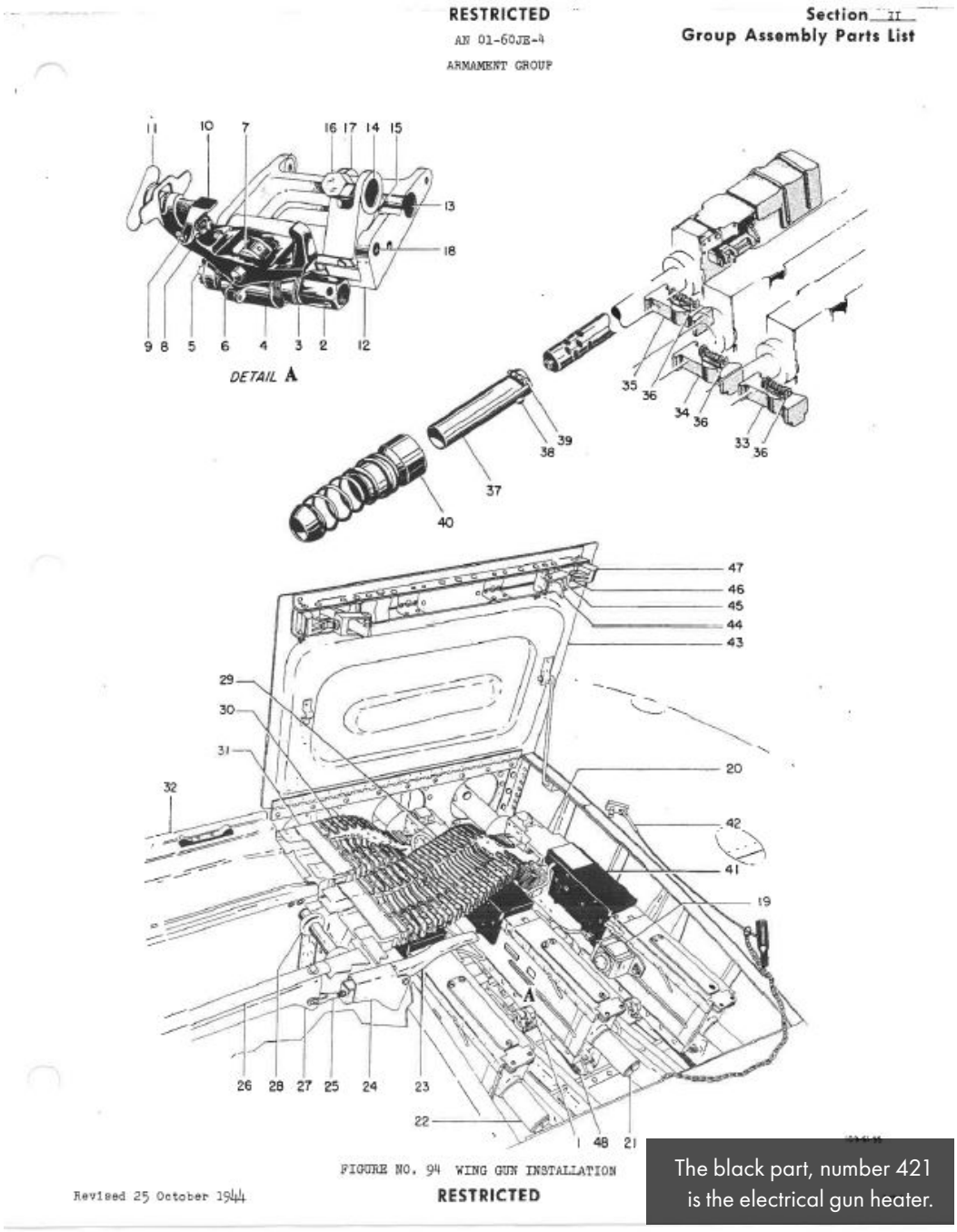


Gun Heat assembly diagram, P-47 Part catalog, page 351

3) The gun bay heat control assembly was not included in P-47D-15 through P-47D-30 airplanes. On these airplanes the duct dampers are spring loaded to the open position so a constant supply of heat is provided.

4) P-47D-20 and subsequent P-47 airplanes have an additional duct to supply heat to the outboard gun. On P-47D series airplanes, this consists of a separate duct which picks up heat as it enters the gun bay and directs it to the outboard gun. On P-47N airplanes, a "Y" is included in the heating duct; one branch directing heat to the inboard side of the gun bay and the other branch directing heat to the outboard gun."

This system is a stark contrast to the P-51 and many other fighters which used electrical gun heat systems as shown in these diagrams from the P-51 Parts manual:



The black part, number 421 is the electrical gun heater.

Section IV
Paragraph 23

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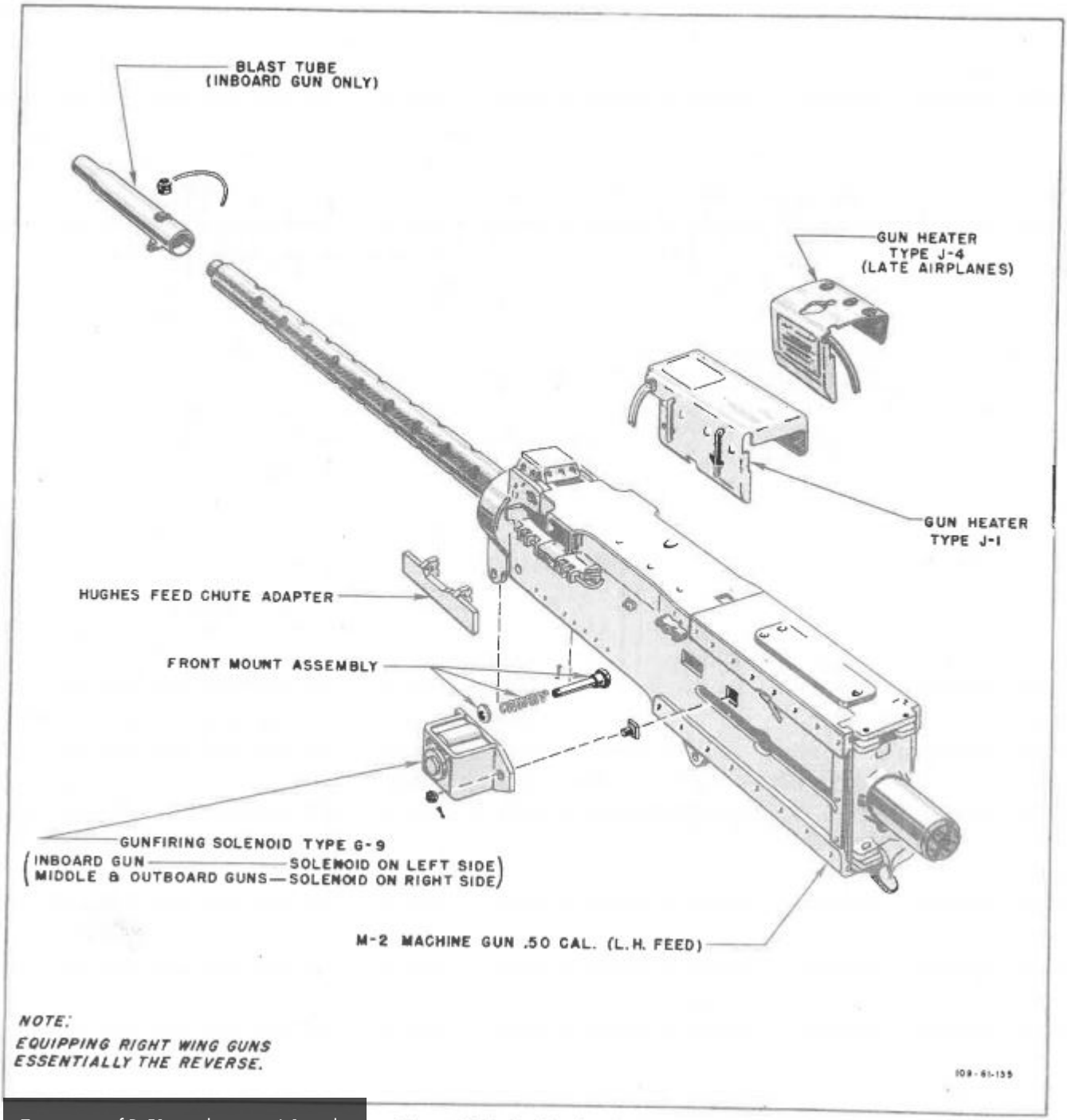


Figure 444—Equipping Guns

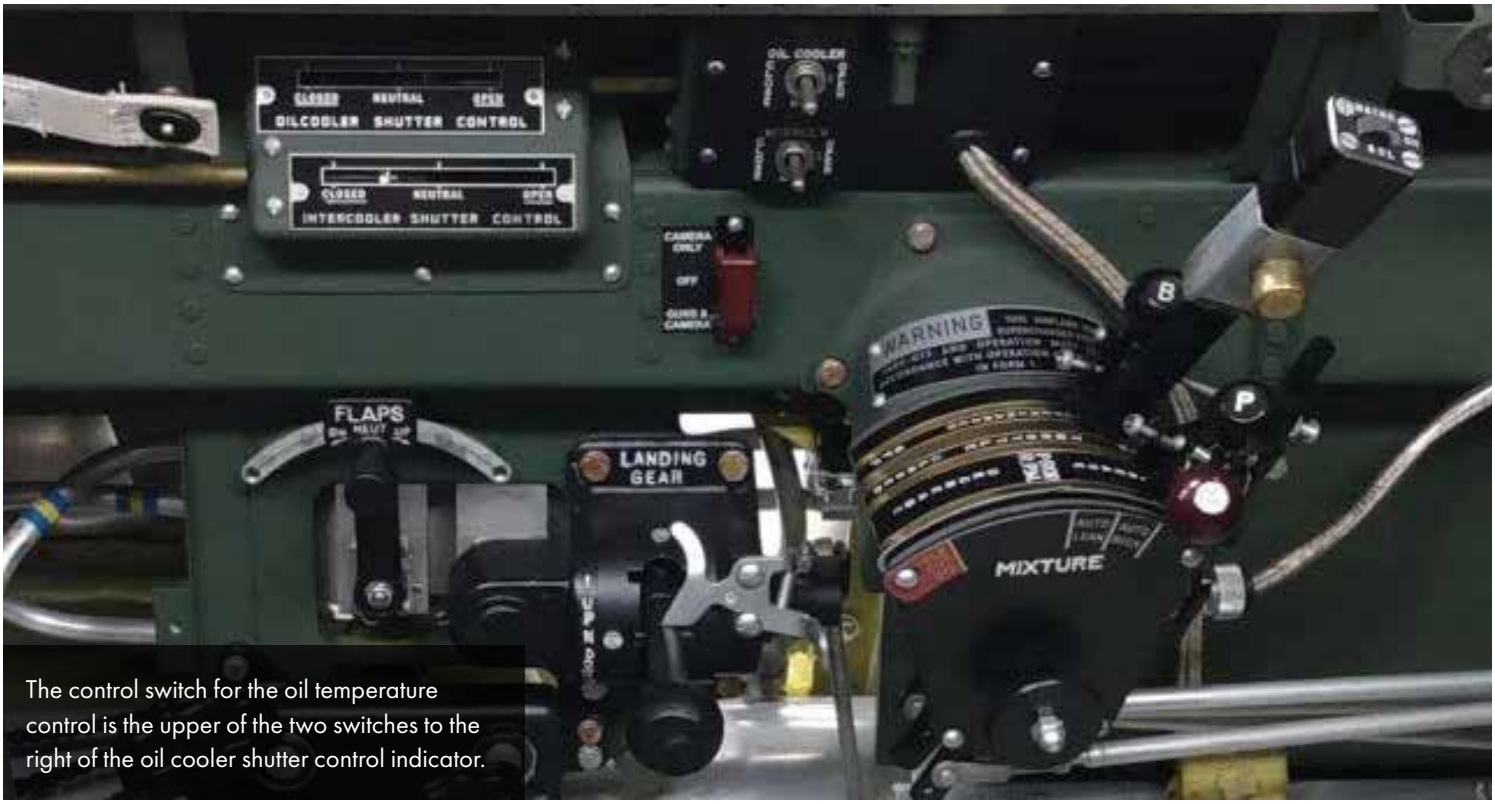
Two types of P-51 gun heaters, J-1 and J-4, are shown in this parts diagram.

Another difference between the Mustang and Thunderbolt is how the oil temperature was controlled. On a P-47, an oil temperature regulator is controlled manually via electrical switches. From the *Pilot Flight Operating Instructions* for the P-47:

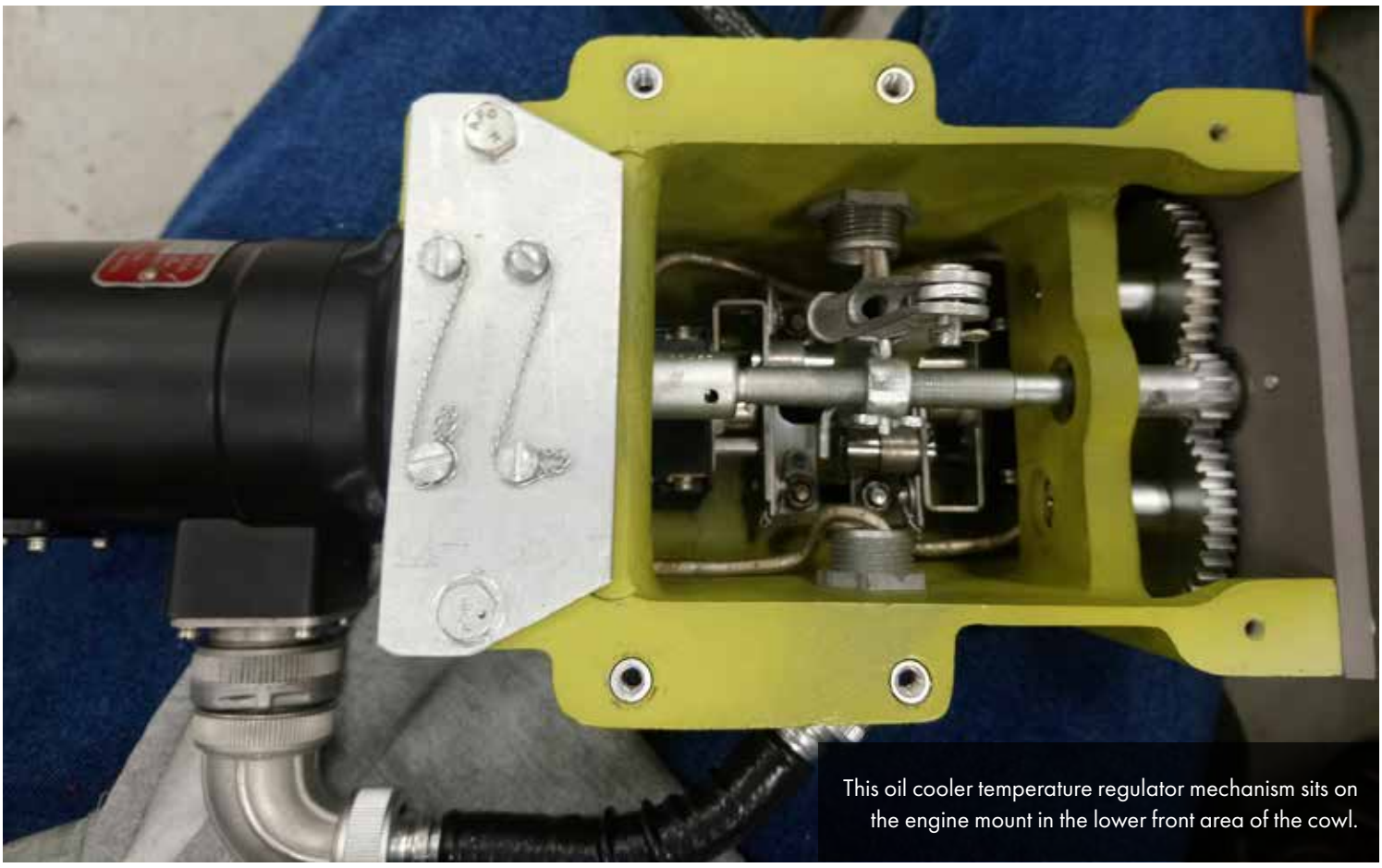
"Oil COOLERS.---- Two oil coolers are installed , one on each side of the lower part of the engine compartment. Adjustable split doors are located in the exit ducts and are electrically operated and controlled from the cockpit by a switch."

The oil temperature regulator switch location varied, some P-47s had it on the main switch panel, but our D-23 had it mounted near the shutter indicator on the left side of the cockpit.

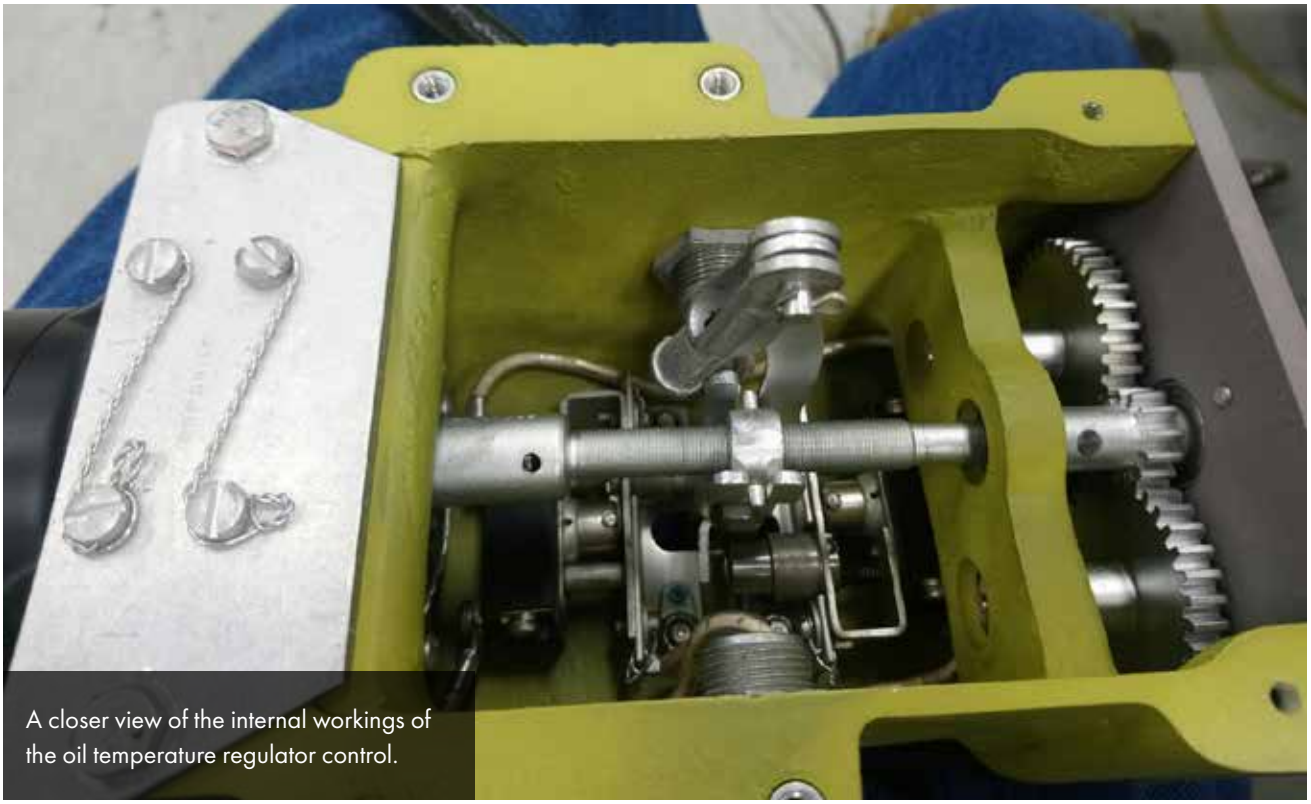
In this cockpit photo, the oil cooler shutter control indicator can be seen just to the right of the message bag strap.



The control switch for the oil temperature control is the upper of the two switches to the right of the oil cooler shutter control indicator.

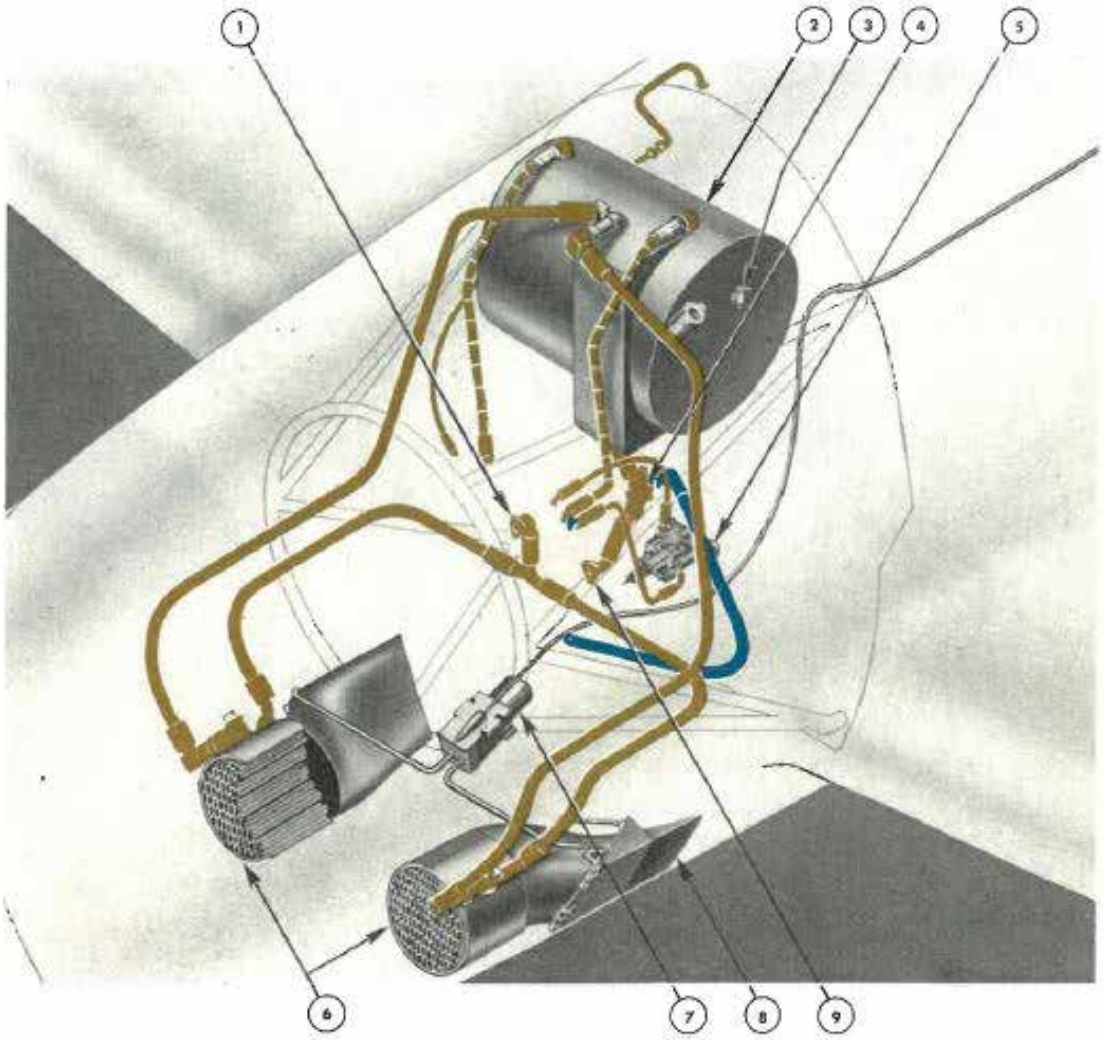


This oil cooler temperature regulator mechanism sits on the engine mount in the lower front area of the cowl.



A closer view of the internal workings of the oil temperature regulator control.

The steel tube bracket is for mounting the oil temperature regulator inside the cowl.



Drain lines
Vent lines
Oil lines

1. Oil from Engine
2. Hopper Type Tank
3. Oil Level Pet Cock
4. Connection for Oil Dilution
5. Supercharger Regulator
6. Oil Coolers
7. Temperature Regulator
8. Air Outlet Duct
9. Oil to Engine

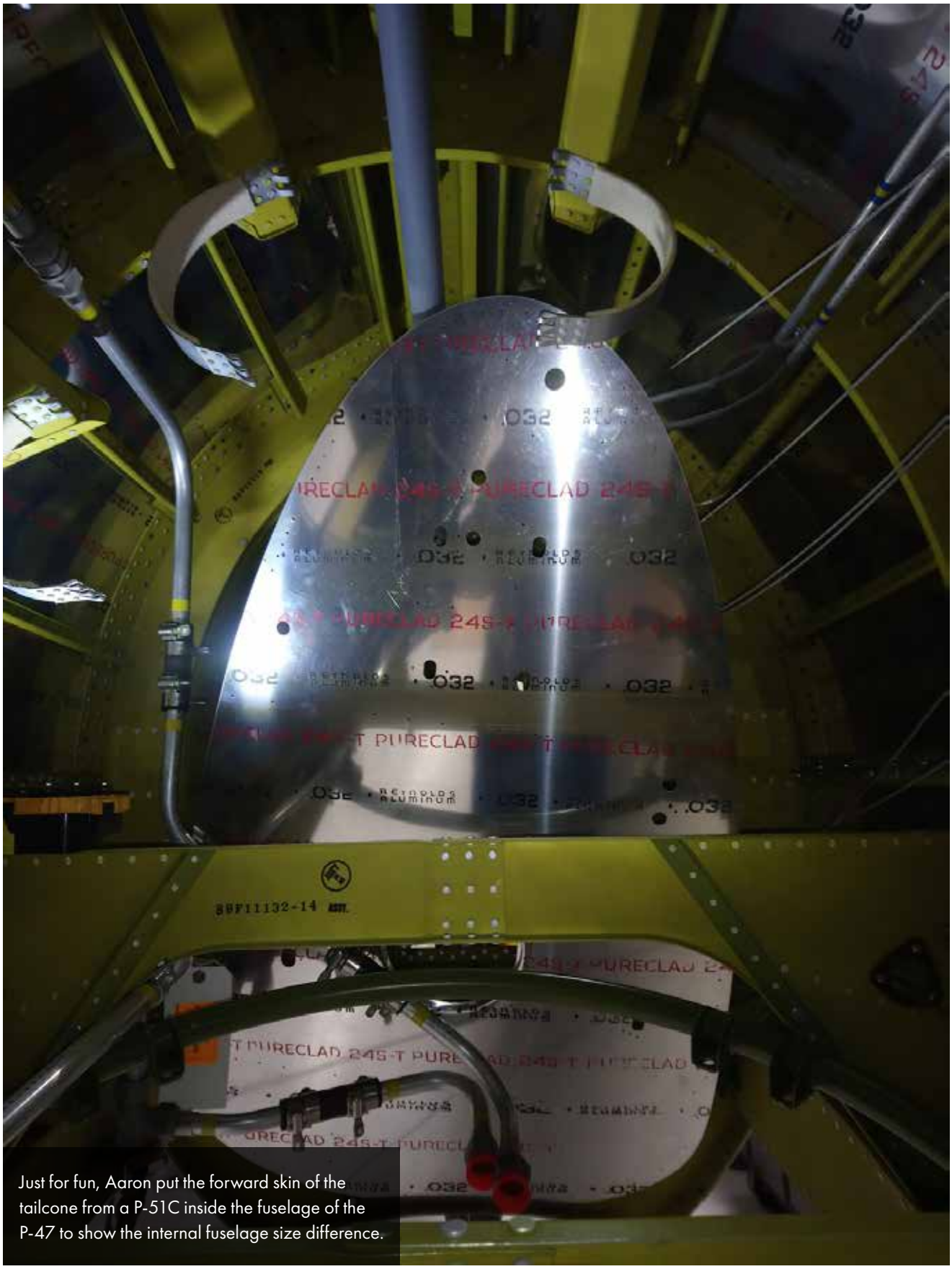
Figure 27—Oil System Diagram

This diagram from the the Pilot's Flight Operating Instructions manual shows the location of the oil cooler temperature regulator box assembly (#7).

In contrast to the manually controlled oil temperature regulating system on the P-47, the P-51 had a more automated system.

Located near the top, slightly left of center, is the radiator air control switch box from P-51C Lope's Hope 3rd. The oil temperature control switch showing the 4 positions is the right switch in the switch box.

Oil temperature on a P-51 was controlled automatically by an electric actuator for the oil radiator air outlet flap. The control is on the radiator control panel and has 4 positions OFF, CLOSE, AUTOMATIC, and OPEN. In normal operation, the switch was left in AUTOMATIC and a thermostat automatically starts and stops the actuator to move the oil radiator air outlet flaps. Only if the automatic feature fails and an abnormal temperature is indicated is it necessary to control the flap manually by changing switch positions between OPEN and CLOSED.



Just for fun, Aaron put the forward skin of the tailcone from a P-51C inside the fuselage of the P-47 to show the internal fuselage size difference.