



May/June 2020

MAY/JUNE

Dakota Territory Air Museum's P-47 Update
by Chuck Cravens



AIRCORPS AVIATION



P-47 fuselage as systems installation takes place.



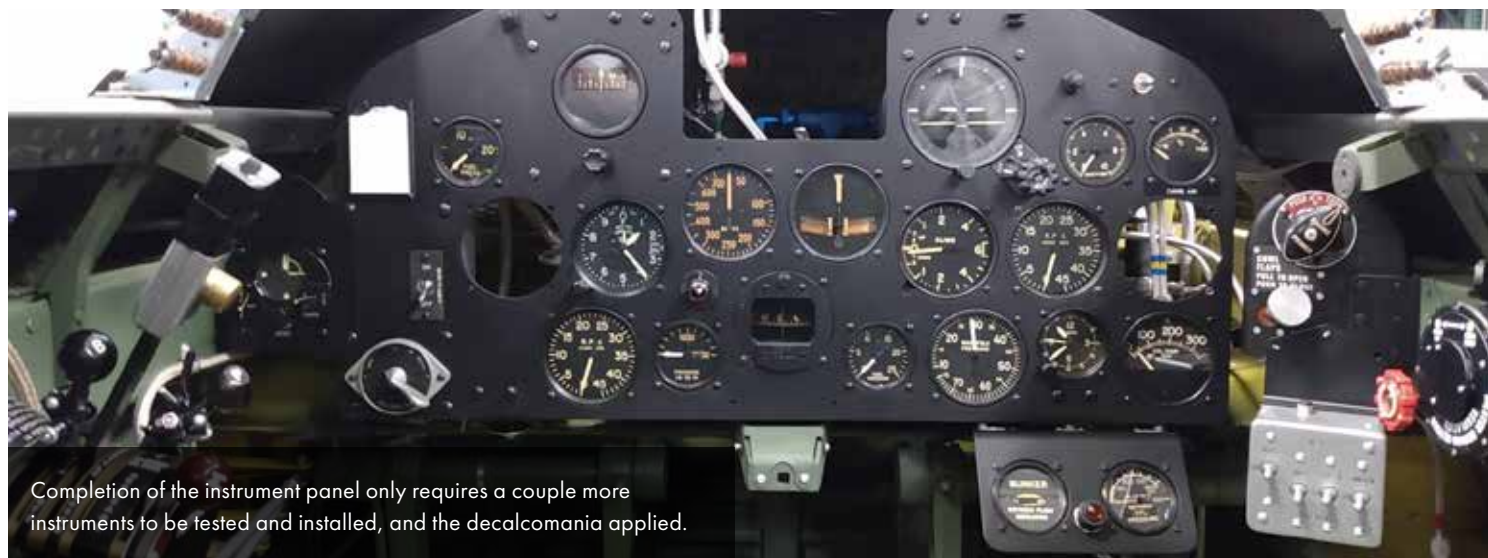


Update

The installation of instruments, hydraulic, water injection, and oil tanks was a large part of the restoration work this month. Progress on the wing assembly was also made as the Thunderbolt gets closer and closer to completion.

Cockpit

Aaron has been busy continuing systems and instrument installation in the P-47 cockpit.



Completion of the instrument panel only requires a couple more instruments to be tested and installed, and the decalcomania applied.



On the left side of the instrument panel is this odd looking instrument called a **BC-608-A Contactor Unit Clock**.

Installed in Allied aircraft as part of the Identification, Friend or Foe (IFF) program during World War II, this system would send a signal for 14 seconds of every minute over the pilot's radio to the ground station. The pilot could not speak while the unit was broadcasting. Designed to fit in a standard gauge slot, it has two switches (contactor in or out, and clock stop or run), has one small knob (wind), and has a clock face that indicates the time the unit is broadcasting.¹

¹ National Museum of the Air Force, <https://www.nationalmuseum.af.mil/> accessed 6/18/2020



Systems installation continues, the upper black control subpanel has the primer and cowl flaps control, and attached below is the signal light box. The others will be identified in following detail shots.



This is the oxygen flow indicator blinker and pressure gauge.



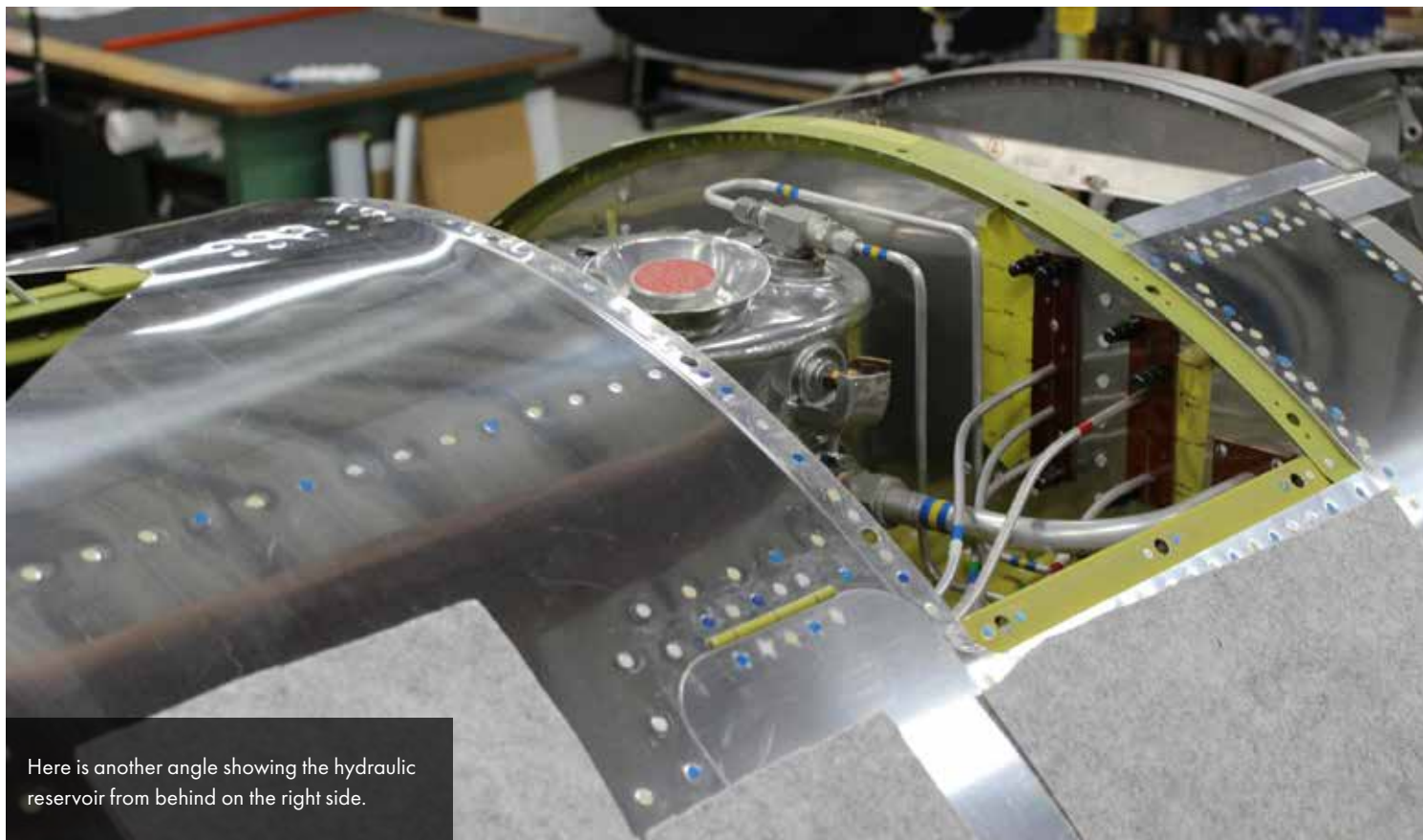
This tube pointing upward between the rudder pedals is the fresh air vent.

Fuselage

Hydraulic system tanks, oil tanks, and the initial fitting of the water injection tank made up much of the fuselage work this month.



The hydraulic reservoir mounts in a space behind the upper firewall.



Here is another angle showing the hydraulic reservoir from behind on the right side.



The labeling on the top of the hydraulic reservoir cap tells how tightly to attach it and specifies the correct fluid.



The round silver part is the instrument vacuum filter. This one was an NOS (new old stock) part Sam located. The box was unopened and dated May 11, 1942. So until Aaron opened it, this filter hadn't been touched by human hands in almost exactly 78 years.



The empty box will hold a starter relay that is now required by Tech Order 01-65BC-115 issued May 26, 1945. It would not have originally been installed on 42-27609, but a shortage of starter JH-5B starters (which had a relay built into the starter) necessitated a switch to another starter, series JH-4E, which required a separate relay.



RESTRICTED

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON 25, D. C.TECHNICAL ORDER
NO. 01-65BC-115
1F-47D-210

26 May 1945

AIRCRAFT AND MAINTENANCE PARTS

**REPUBLIC—INSTALLATION OF TYPE JH-4ER STARTER—P-47C
AND P-47D**

This Technical Order replaces T. O. No. 01-65BC-115, dated 25 August 1944, revised to make corrections as indicated by black revision lines, and to incorporate new figures 8 and 12.

NOTE As prescribed in T. O. No. 00-20A, appropriate reference to this Technical Order will be entered on AAF Forms 60-A for the aircraft affected. The work directed herein will be accomplished as soon as practicable by service activities with the aid of base maintenance facilities, if necessary. Commanding Officers will be responsible that the information contained in paragraph 1.b. of this Technical Order is brought to the attention of all pilots cleared for operation of the subject aircraft as well as those undergoing Transition Flying Training as contemplated in AAF Regulation 50-16. Airplanes reworked in accordance with T. O. No. 01-65BC-115, dated 25 August 1944, and so indicated on the Form 60-A, need not be reworked in accordance with this Technical Order.

1. a. To alleviate shortages of type JH-5B starters which are being superseded by type JH-4E series starters, and to provide standardization of starter installations, the engine starter installation on the following airplanes will be modified in accordance with the instructions contained in paragraph 2.

MODEL	AF SERIAL NOS.
RP-47C-RE	41-6067 to 41-6123 incl
P-47C-1RE, 2RE, 5RE	41-6124 to 41-6667 incl
P-47D-1RE, 2RE, 5RE	42-7853 to 42-8702 incl
P-47D-6RE, 10RE, 11RE, 15RE, 16RE, 20RE	42-74615 to 42-76614 incl
P-47D-20RE, 21RE, 22RE 25RE	42-28274 to 42-28773 incl
P-47D-RE, 2RA, 3RA, 4RA, 11RA, 15RA, 16RA	42-22250 to 42-23299 incl
P-47D-20RA, 21RA, 22RA, 25RA	43-25254 to 43-25753 incl
P-47D-23RA, 26RA	42-27389 to 42-28438 incl

P-47D-28RA airplane, AF No. 42-28439 and subsequent, and P-47D-27RE airplane, AF No. 42-26774 and subsequent, will be modified by the contractor prior to delivery.

b. The type JH-4E starter is a combination inertia and direct cranking starter and is similar in operation to the type JH-5B starter removed. The type B-8 starter relay installed, takes the place of the brush engaging solenoid in the JH-5B starter in that it connects or disconnects the main bus with the starter motor brushes. Prior to energizing the JH-4E starter electrically, the starter should always be momentarily meshed electrically to insure that the brushes are seated on the commutator. In the event of manual operation, the starter should first be meshed manually to insure that the brushes are lifted and locked off the commutator, then energize and mesh manually. More

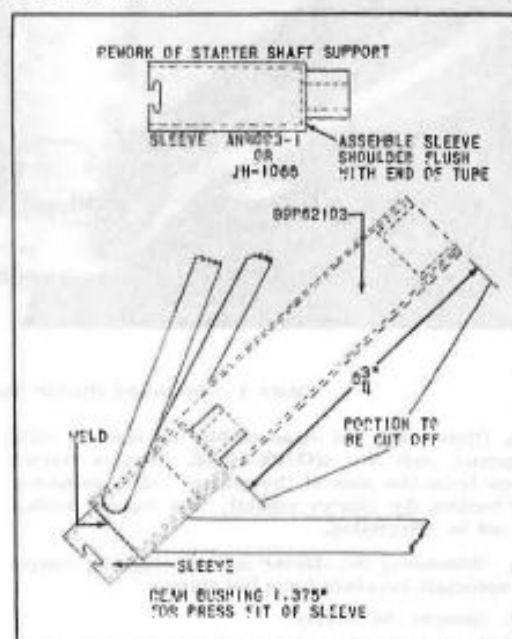


Figure 1 - Rework of Starter Shaft Support
complete information pertinent to the type JH-4E starter may be obtained from T. O. No. 03-5CA-13.

2. MODIFICATION.

The instructions for accomplishing this change are as follows:

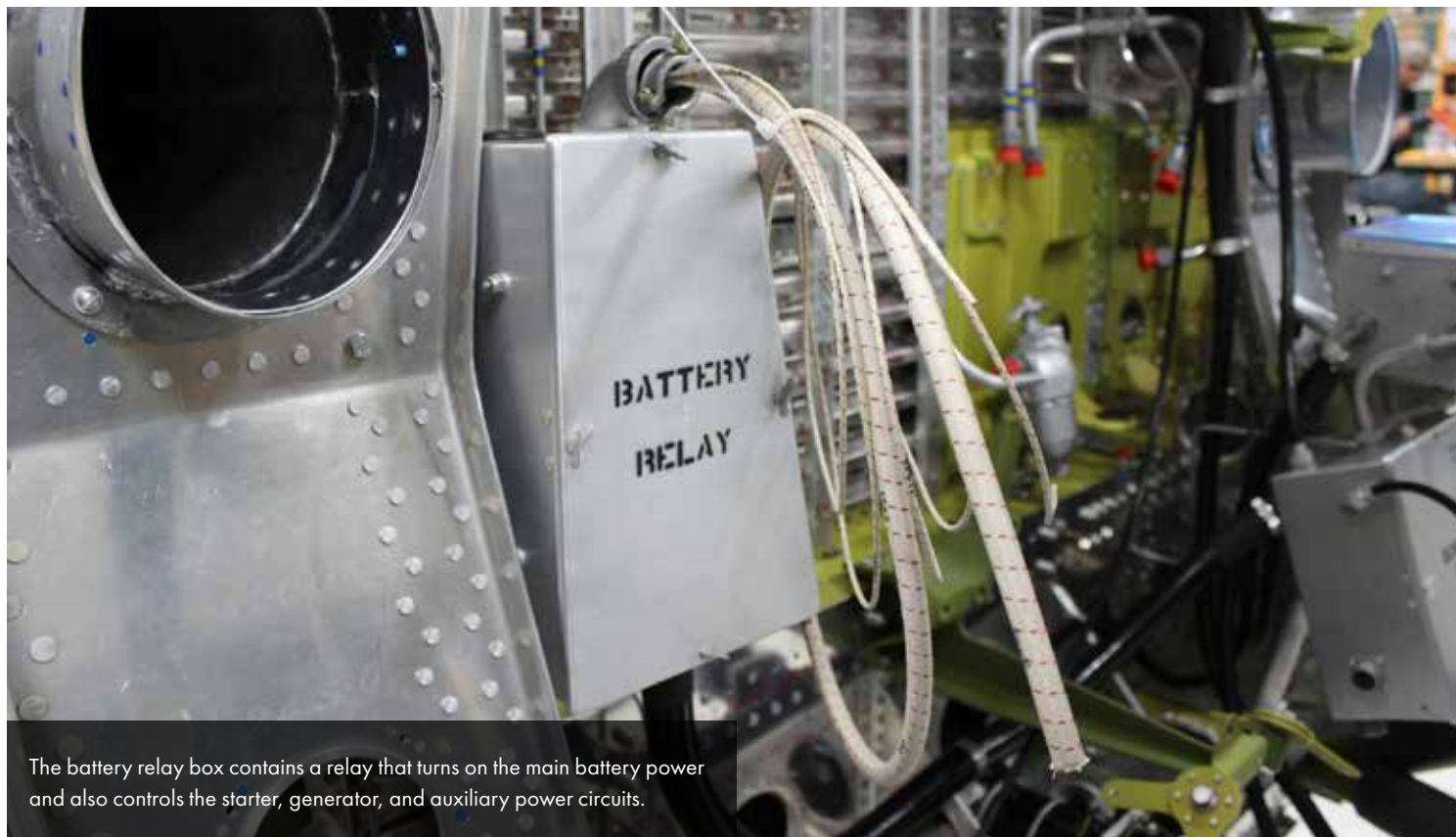
a. Remove the airplane battery to provide accessibility to the engine accessory compartment, and to prevent possibilities of fire due to short circuit.

NOTICE: This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U. S. C., 31 and 32, as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

W F 01-65-21-15-10/200

RESTRICTED

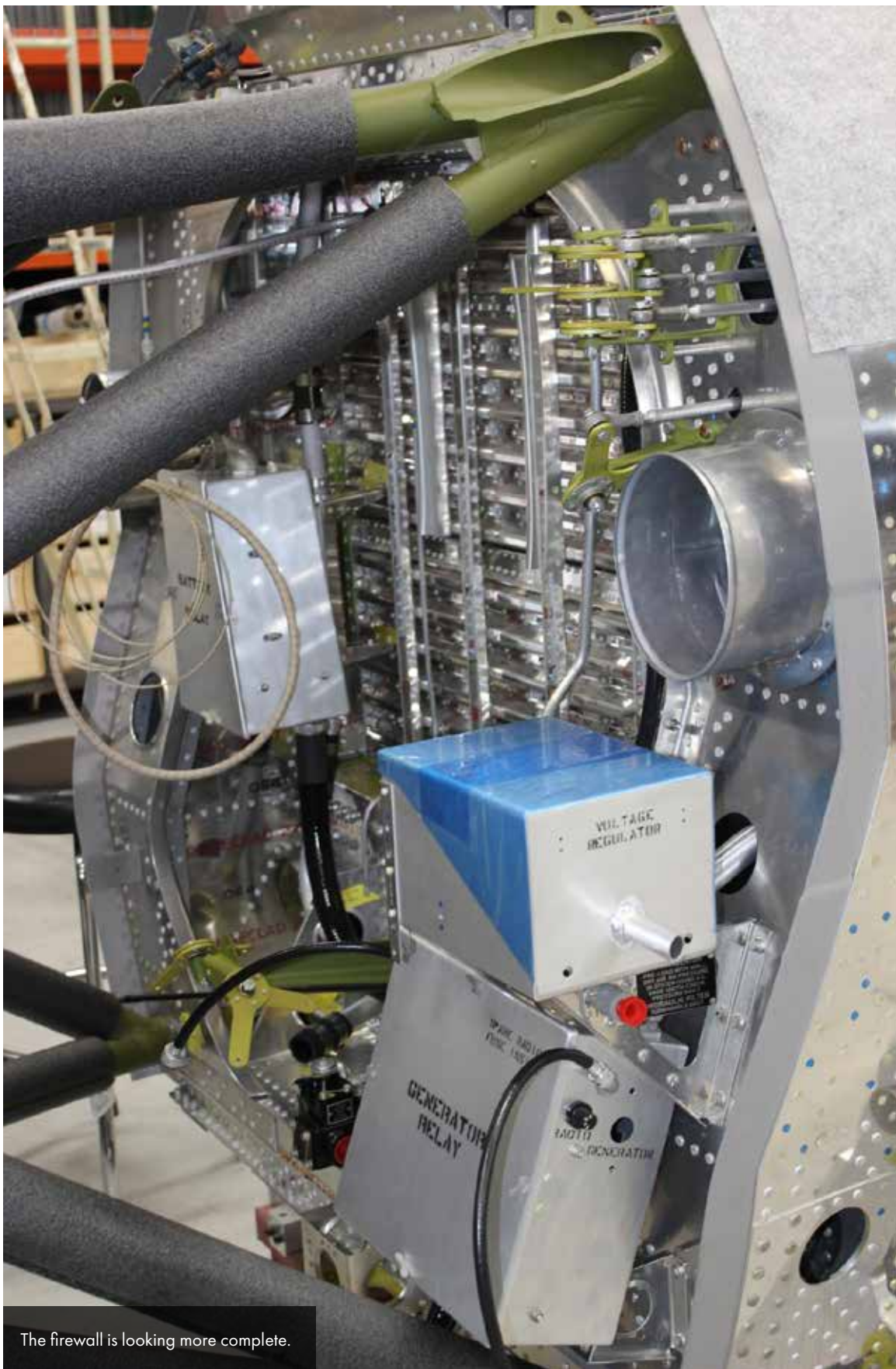
1



The battery relay box contains a relay that turns on the main battery power and also controls the starter, generator, and auxiliary power circuits.



This small metal chop saw has turned out to be very handy for squaring the many tubing ends in the P-47 fuel, oil, vacuum, and hydraulic plumbing systems.



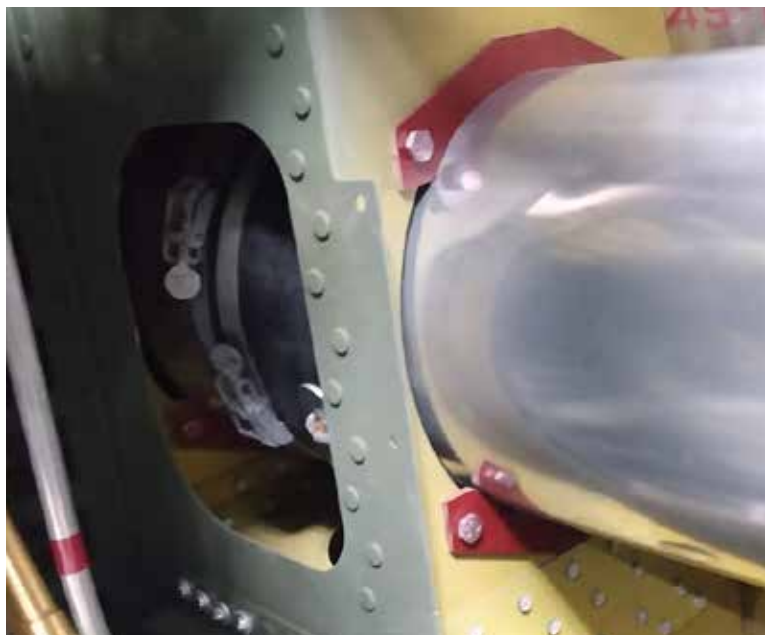
The firewall is looking more complete.



Another firewall view from the other side shows the connection between the voltage regulator and generator relay boxes.



The supercharger oil tank is permanently mounted on the back of the Christmas tree tank enclosure.



This duct carrying pressurized air from the turbo supercharger to the carburetor has a sleeve connection located in an extremely tight place. It was a real challenge to install it in that space without some disassembly of already finished structure.



This view is of the Christmas tree tank housing from the rear.

The turbo supercharger oil tank is visible, including the drain tube on top and fitting for the feed line on the bottom. The webbing straps in the center left of the photo are for stowing the canvas engine cover.



Oil Tank



Aaron needed to put the engine oil tank in place to fabricate some oil lines, so Lance and Aaron discuss how they'll accomplish that.



Aaron carries the tank over.



Aaron and Lance are almost ready to put the tank in place.



They work it into place.



It took a lot of wiggling and adjusting to get the tank into the crowded accessory area.



At last the oil tank is in position.



Water Tank

The P-47D-23RE had a 15 gallon tank to hold the water/methanol for the water injection system. Water/Alcohol injection cools the flame temperature and controls flame propagation, thus preventing detonation which can break piston rods and pistons. These systems allowed for higher manifold pressure, and added 300 Horsepower at the push of a button on the throttle quadrant.² The tank allowed about 5 minutes of power boost. Latter versions of the P-47 (P-47D-25RE and subsequent) doubled the capacity of the water tank.

¹ Graham White, *Allied Aircraft Piston Engine of WWII*, Warrendale, PA, Society of Automotive Engineers, 1995, p244



The brown colored straps in this photo will hold the water injection tank to the firewall.



This closer image shows the metal straps cushioned by cork.



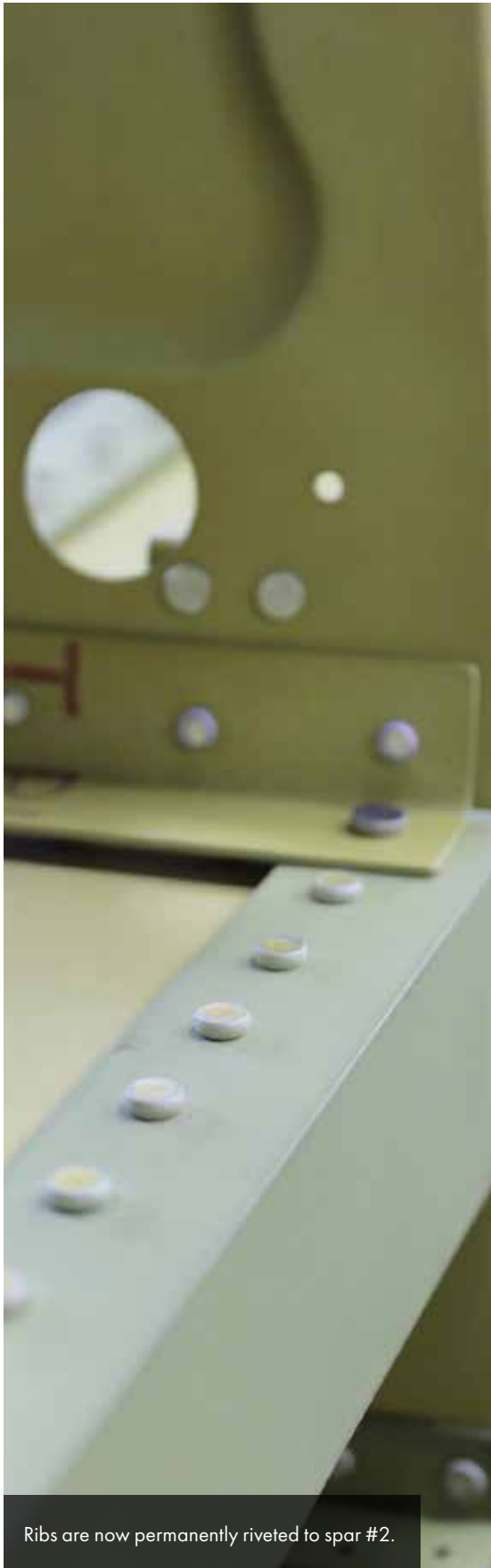
Aaron holds up the water tank.

Wings

The wings are complex and take a long time to assemble, but progress continues.



Some preliminary wing skin fitting is visible on this leading edge section.



Ribs are now permanently riveted to spar #2.



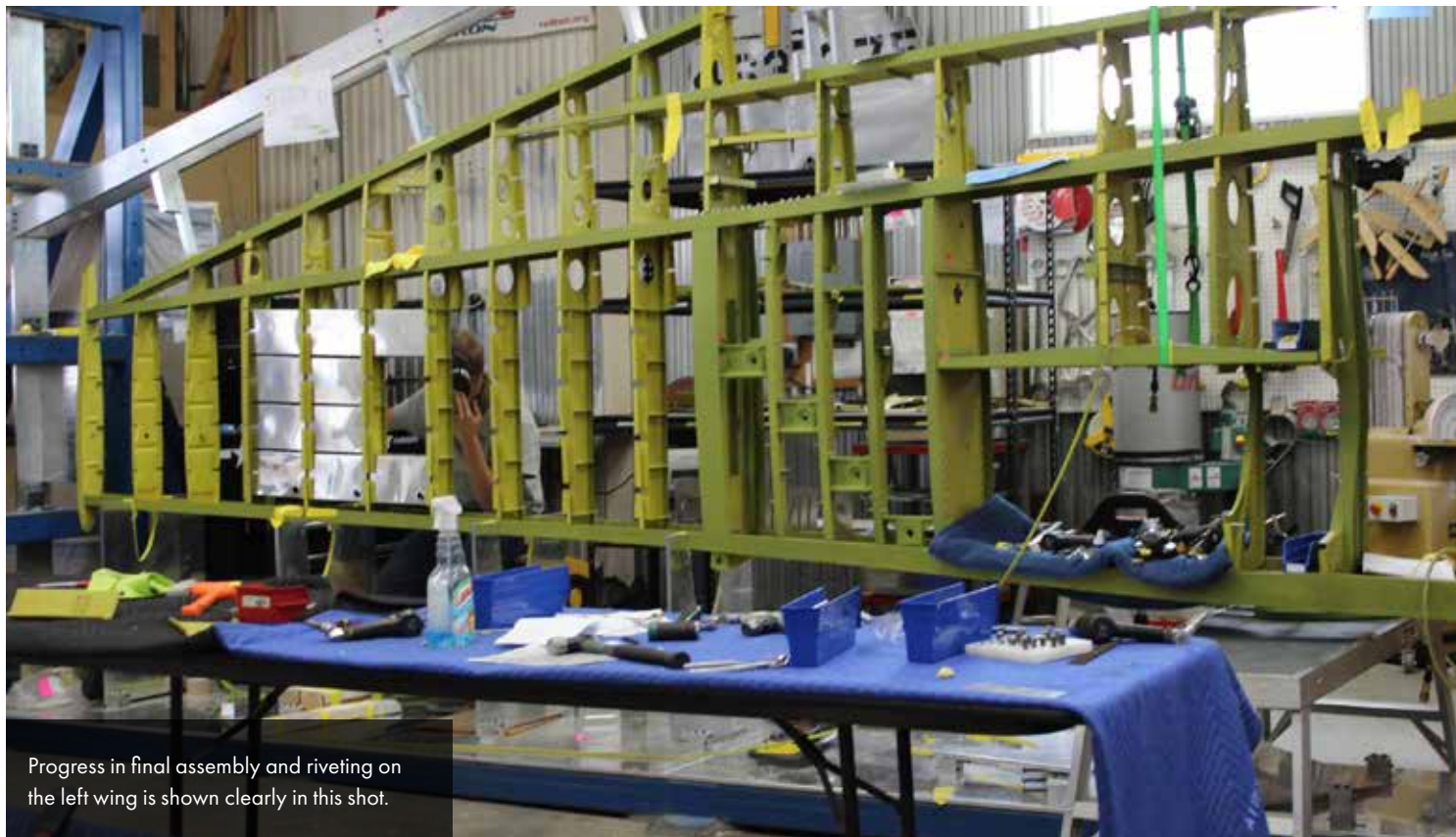
The fixture holds spar #1 as Cory works.



Cory continues assembly of spar #1.



Several tables are needed to stabilize the long spar as the rivets are being squeezed.



Progress in final assembly and riveting on the left wing is shown clearly in this shot.



These ribs are in the gun bay area, viewed from the bottom of the wing.



The same area viewed from the top.



This part of the wing is where the flap fits (the area with the clamp).



The right wing is shown with the gun bay ribs in place.



The ammunition feed chutes (bare aluminum) have been clecoed in place.



Randy is preparing to buck a rivet.



Randy on this side of the wing works with Cory on the other side as they rivet.



Cory drives a rivet as Randy bucks.



Armament and Drop Tanks

The P-47 was a versatile fighter/fighter-bomber. Bombs, rockets, and of course .50 caliber machine guns, were all part of the possible armament loads. Many different drop tanks were used in the quest to extend the range.

The most common tanks and ordnance are shown below. Normally, the P-47 could carry six or eight .50 cal. machine guns, and either 10 rockets or 2,500 lbs. of bombs, or any combination that totalled 2,500 lbs.

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FARMINGDALE, L. I. NEW YORK		REPORT NO.	411
		MODEL	P-47D

2) Bombs:

(P-47D up to P-47D-5)

No provision.

(P-47D-5 up to P-47D-15)

A type B-7 bomb shackle shall be installed under the fuselage. While this installation shall be incorporated primarily for the purpose of attachment of a 75 or 150 gallon external droppable fuel tank, it may be utilized as a bomb attachment. "Arm-and-safe" and "Release" manual control mechanisms shall be installed. The tanks, fuel, bombs, and external adapters shall be considered alternate load.

(P-47D-15 up to P-47D-30)

The B-7 bomb shackle installed beneath the fuselage shall be replaced by a B-10 bomb shackle. In addition, a B-10 bomb shackle shall be installed beneath each wing for the purpose of attachment of the external fuel tanks as noted on page 53 of this specification. The shackles may be utilized as attachments for 500 or 1,000 pound bombs. Electrical releases shall not be provided. The tanks, fuel, bombs, and external adapters shall be considered alternate load.

(P-47D-30 and up)

The manual controls shall be augmented by electrical release (only) controls and in addition electrical detonation of chemical spray tanks shall be provided.



PREPARED _____
CHECKED _____
REVISED _____

REPUBLIC AVIATION
CORPORATION
FARMINGDALE, L. I., NEW YORK

PAGE 17
REPORT NO. 411
MODEL P-47D

E-1B Crew:

The crew shall consist of the pilot.

E-1C Armament:

E-1C (1) Guns:

Three caliber .50 Model M-2 machine guns shall be installed on each side of the fuselage in the wings outboard of the propeller disc. In addition, one caliber .50 Model M-2 machine gun shall be installed on each side of the fuselage in the wings outboard of the propeller disc as alternate load. Ammunition for these guns is noted below. For further information on these installations see Section E-5A of this specification.

<u>Armament (Design Useful Load)</u>	<u>Amount</u>
Fixed Wing Mounted Machine Guns, Cal..50	6
Ammunition, Cal. .50 (For each gun) (P-47D-RE only)	300 rounds
Ammunition, Cal. .50 (For each gun) (P-47D-1-RE & Up)	267 rounds

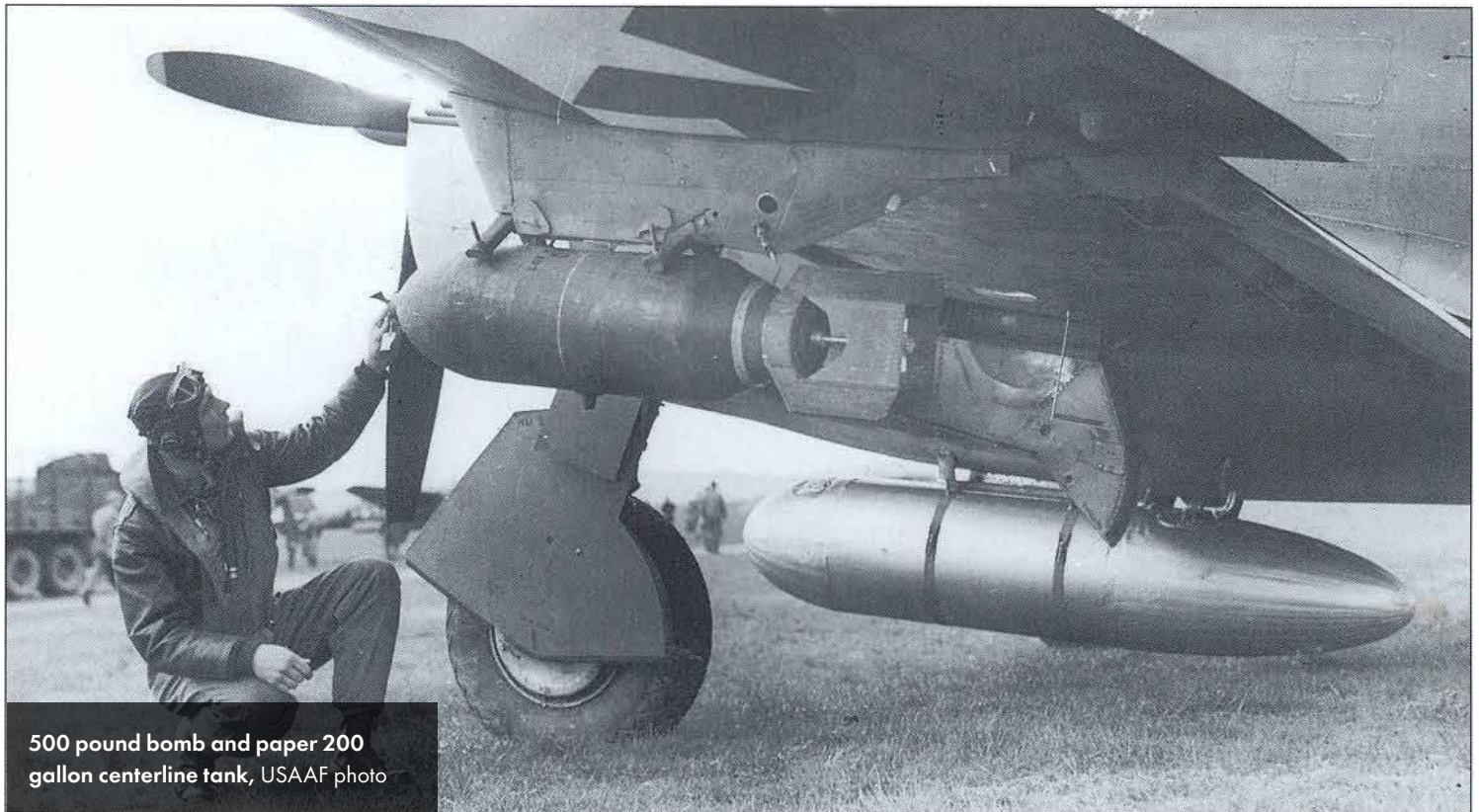
<u>Armament (Alternate Load)</u>	
Fixed Wing Mounted Machine Guns, Cal. .50	2
Ammunition, Cal. .50 (For each gun) (P-47D-RE Only)	300 rounds
Ammunition, Cal. .50 (For each gun) (P-47D-1-RE & Up)	267 rounds

Here is an interesting Republic Aviation document that originally specified 3 .50 caliber Brownings in each wing with a four gun wing as an alternate load. Bomb shackles are also specified on the second page. The vast majority of combat P-47s carried four guns in each wing.

Rev. C



The eight .50 caliber Browning M-2s are familiar, so we will examine the more common drop tank and bomb and rocket loads.



500 pound bomb and paper 200 gallon centerline tank, USAAF photo

A variety of different drop tanks were fitted to the Thunderbolt during its career. The earliest tanks were the conformal 200 gallon ferry tanks, and the lozenge-shaped flat 200 gallon belly tank. The P-47 also used British-designed 108 gallon and 200 gallon tanks made of plastic-impregnated paper. These "paper" tanks were relatively inexpensive but couldn't store fuel for long periods of time. With the increased fuel capacity gained with drop tanks, the P-47 was able to perform missions deep into enemy territory.

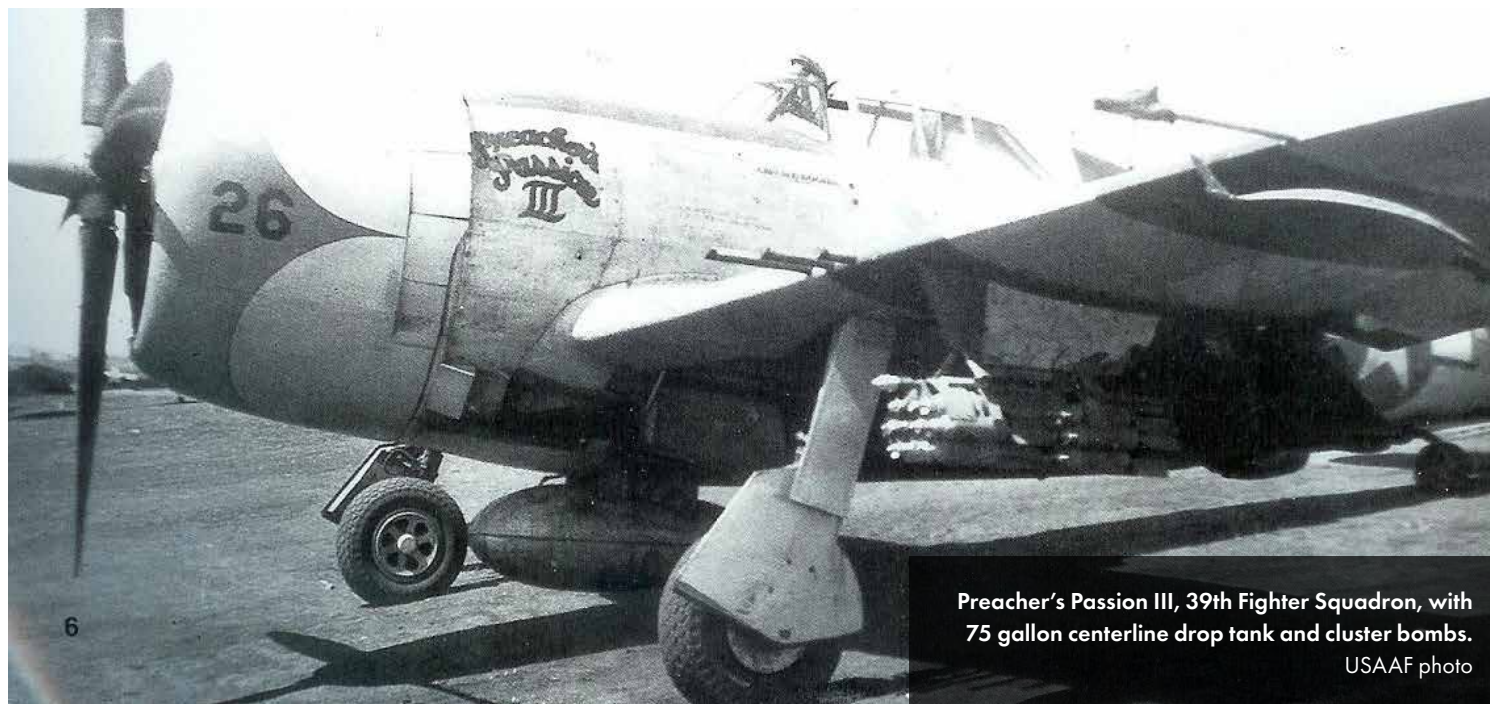


This photo shows the British-designed paper 108 gallon drop tank on the centerline and 1000 pound bombs on the wings. The B-10 shackles for the bombs are mounted in the wing pylons, USAAF photo



75 gallon drop tanks. USAAF photo

Later, teardrop-shaped 75 US gallon and 150 US gallon metal wing drop tanks were adopted. Another drop tank that was used was the 165 gallon teardrop tank first intended for the P-38.



Preacher's Passion III, 39th Fighter Squadron, with 75 gallon centerline drop tank and cluster bombs. USAAF photo



165 gallon P-38 drop tanks are seen on these Thunderbolts. USAAF photo



4.5 inch Rocket tubes and 500 pound bombs. USAAF photo

British 5 inch rockets were also used.