ERECTION AND MAINTENANCE INSTRUCTIONS

FOR

AIRPLANES

ARMY MODELS

L-4A, L-4B, L-4H and L-4J

BRITISH MODEL

PIPER CUB

Published under joint authority of the Commanding General, Army Air Forces, the Chief of the Bureau of Aeronautics, and the Air Council of the United Kingdom.

MOANA 5-22-47 1500

25 AUGUST 1943

Revised 30 JULY 1945

POLICY GOVERNING DISTRIBUTION AND USE OF THIS PUBLICATION

Instructions Applicable to U. S. Army Personnel:

1. This publication is intended for technical aid and education of military and civilian personnel engaged in promoting the war effort. Its maximum distribution and use is therefore encouraged. However, since the publication is "restricted" within the meaning of AR380-5, the following security regulations will be observed:

a. *Members of Armed Forces and civilian employees of War Department* will be given access to this publication whenever required to assist in the performance of their official duties (including expansion of their knowledge of AAF equipment, procedures, etc.).

b. *Personnel of War Department contractors and subcontractors* may be given possession of this publication, on a loan basis, or knowledge of its contents, only when required to assist in the performance of War Department contracts. Releases will be made in accordance with the requirements of T. O. No. 00-5-2.

c. *Representatives of other governments* will be given possession of this publication, or knowledge of its contents, only in accordance with AAF Letter No. 45-6.

2. This publication is restricted because the information contained in it is restricted. It does not follow that the physical article to which it relates is also restricted. Classification of the materiel or component must be ascertained independently of the classification of this document.

3. Neither this publication nor information contained herein will be communicated to press or public except through Public Relations channels.

Instructions Applicable to U. S. Navy Personnel:

1. Navy Regulations, Article 76, contains the following statements relating to the handling of restricted matter:

"Par. (9) *(a)*. Restricted matter may be disclosed to persons of the Military or Naval Establishments in accordance with special instructions issued by the originator or other competent authority, or in the absence of special instructions, as determined by the local administrative head charged with custody of the subject matter."

"*(b)* Restricted matter may be disclosed to persons of discretion in the Government service when it appears to be in the public interest."

"*(c)* Restricted matter may be disclosed, under special circumstances, to persons not in the Government service when it appears to be in the public interest."

2. The Bureau of Aeronautics Aviation Circular Letter No. 90-44 contains the following paragraph relative to the use of aeronautical technical publications:

"Par. 8. *Distribution to All Interested Personnel.* In connection with the distribution of aeronautical publications within any activity, it should be borne in mind by the offices responsible for such distribution that technical publications, whether confidential or restricted, are issued for use not only by officer personnel, but also by responsible civilian and enlisted personnel working with or servicing equipment to which the information applies."

3. Disclosure of technical information in this publication may not be made to representatives of foreign governments except in instances where those foreign governments have been cleared to receive information concerning all equipments covered by this publication.

Instructions Applicable to British Personnel:

FOR OFFICIAL USE ONLY.—Not to be communicated to anyone outside of His Majesty's Service. Not to be published. The information given in this document is not to be communicated, either directly or indirectly, to the press or to any person not holding an official position in His Majesty's Service.

LIST OF REVISED PAGES ISSUED

NOTE: A heavy black vertical line to the left or in outer margin of text on revised pages, indicates extent of revision. This line is omitted where more than 50 percent of page is revised. A black horizontal line to the left of page numbers listed below indicates pages revised, added or deleted by current revision. This line is used only on second and subsequent revisions.

Page No.	*Date of Latest Revision*
iv	5 March 1945
1	5 March 1945
7	5 March 1945
8	5 March 1945
8A	5 March 1945
8B	5 March 1945
16	5 March 1945
17	5 March 1945
–30	30 July 1945
37	20 June 1945

AAF

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

AAF ACTIVITIES.—In accordance with T. O. No. 00-5-2, Air Inspectors will submit requisitions (AAF Form 104B) to:

Commanding General
Fairfield Air Technical Service Command
Patterson Field, Ohio
Attn: Publications Distribution Branch

NAVY ACTIVITIES.—Submit requests to Chief, BuAer, Navy Department, Washington, D. C., Attention: Publications Branch on order form NAVAER-140. For complete listing of available material and details of distribution see Naval Aeronautic Publications Index, NavAer 00-500.

BRITISH ACTIVITIES.—Submit requirements on Form 294A, in duplicate, to the Air Publications and Forms Store, New College, Leadhall Lane, Harrogate, Yorkshire, England.

LIST OF REVISED PAGES ISSUED

NOTE: A heavy black vertical line to the left or in outer margin of text on revised pages, indicates the extent of the revision. This line is omitted where more than 50 percent of the page is revised. A black horizontal line to the left of page numbers listed below indicates pages revised, added or deleted by current revision. This line is used only on second and subsequent revisions.

Page No.	Date of Latest Revision
iv	5 March 1945
–1	25 July 1947
–2	25 July 1947
7	5 March 1945
8	5 March 1945
8A	5 March 1945
8B	5 March 1945
16	5 March 1945
17	5 March 1945
30	30 July 1945
–34	25 July 1947
37	20 June 1945

AAF

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

AAF ACTIVITIES.—In accordance with AAF Regulation No. 5-9.

NAVY ACTIVITIES.—Submit request to nearest supply point listed below, using form NavAer-140: NAS, Alameda, Calif.; ASD, Guam; NAS, Jacksonville, Fla.; NAS, Norfolk, Va.; NASD, Oahu; NASD, Philadelphia, Pa.; ASD, Samar-Leyte; NAS, San Diego, Calif.; NAS, Seattle, Wash.

For complete listing of available material and details of distribution see Naval Aeronautics Publications Index, NavAer 00-500.

TABLE OF CONTENTS

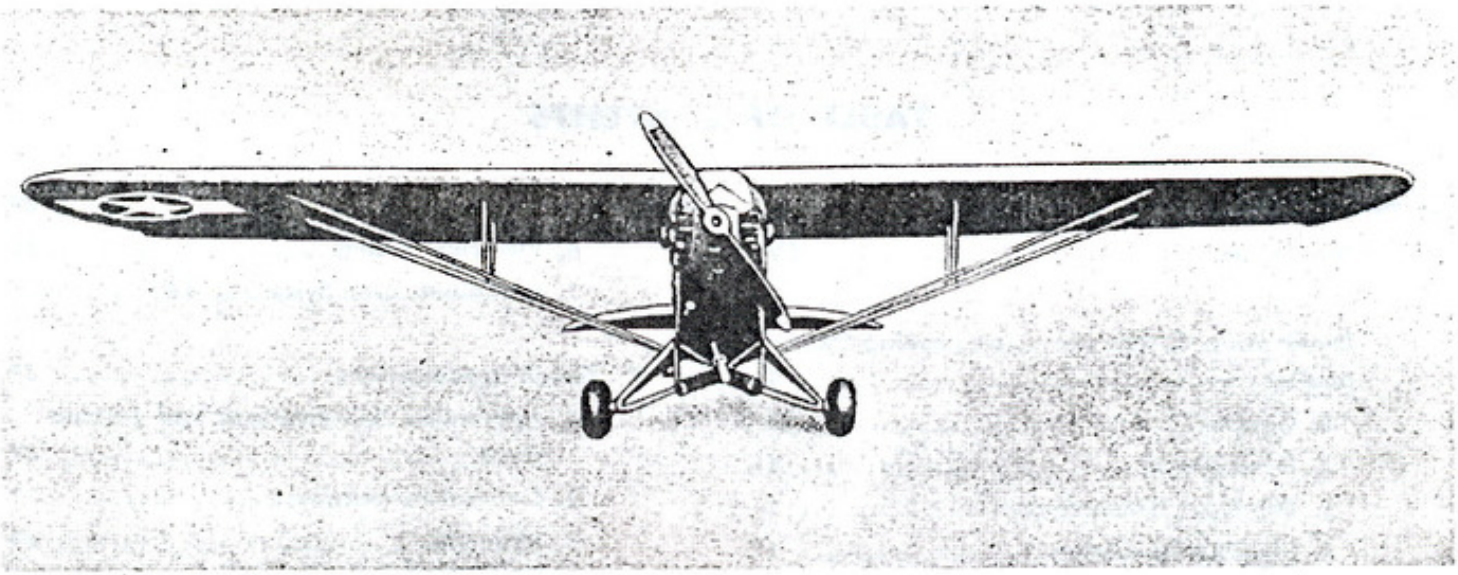


Figure 1—Front View of L-4A

Figure 2—Three-quarter View of L-4A

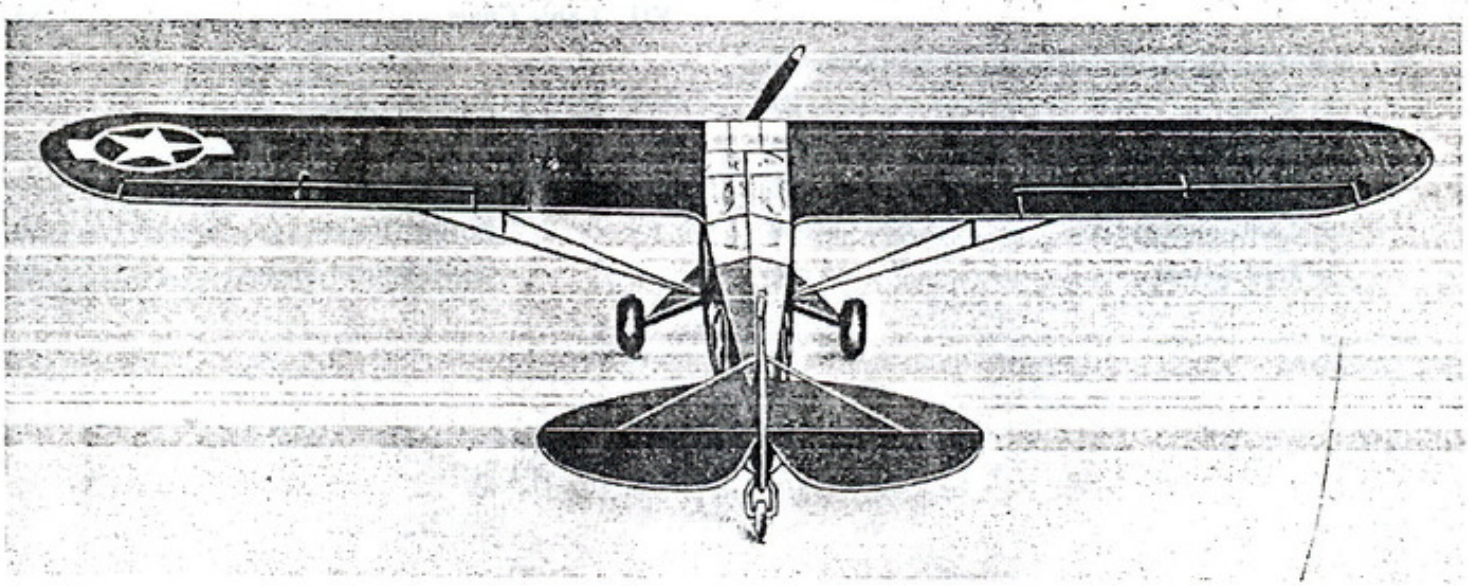


Figure 3—Rear View of L-4A

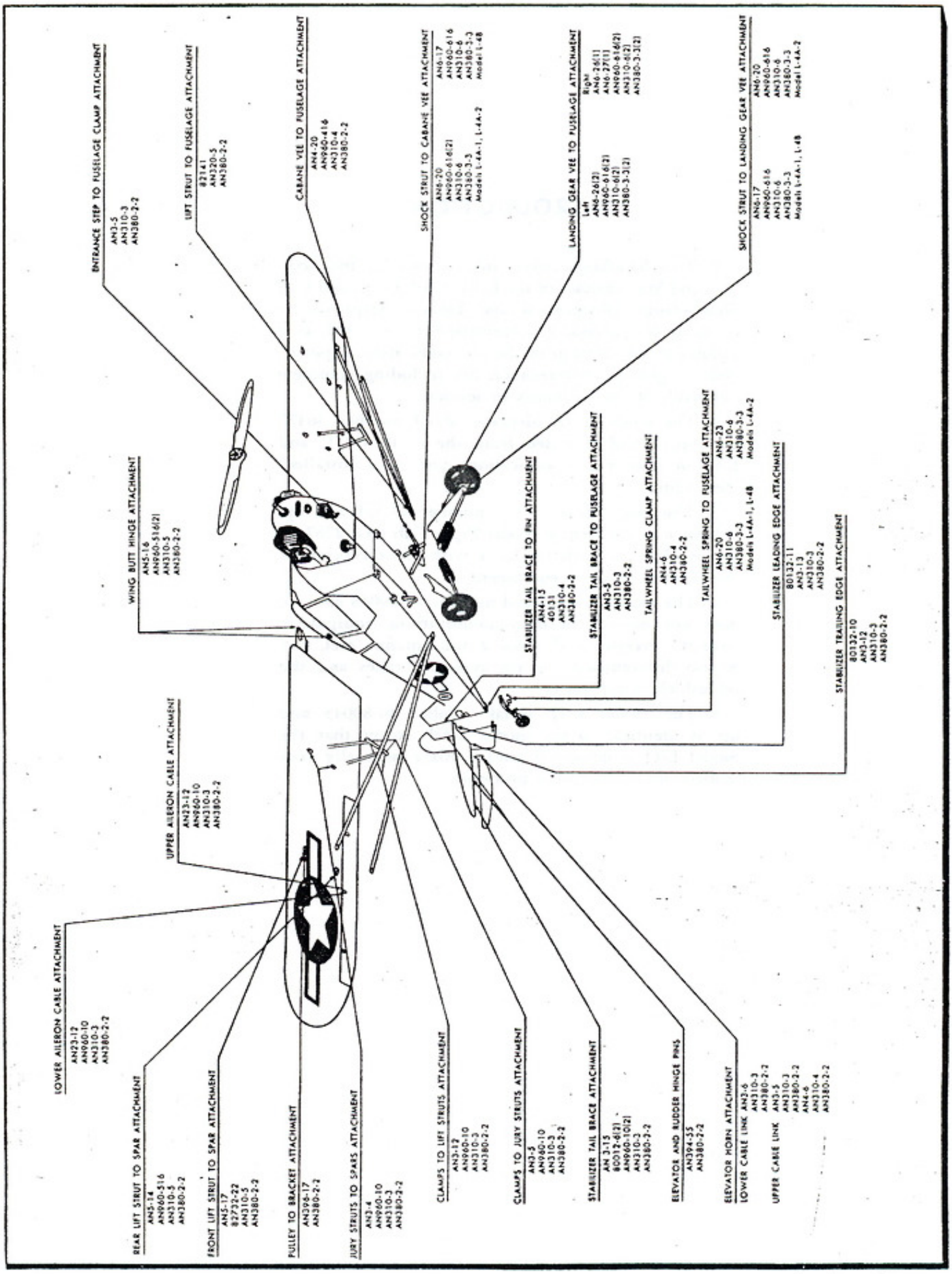


Figure 4—Component Parts Installation

INTRODUCTION

1. This handbook covers instructions for the Erection and Maintenance of the L-4A, L-4B, L-4H, and L-4J Short-range Observation and Liaison Airplanes. It contains the necessary information to be used as a guide for the erection of the airplanes after shipment and the general maintenance, not including complete overhaul, of the airplanes in service.

2. The model L-4A airplane, serial number 36477 and up, is differentiated from the L-4B, L-4H, and L-4J in that a communications system is installed. (See figure 7.)

3. The model L-4B, serial number 43-391 and up, is known as the British model Piper Cub (AP 2387A), and is identical with the L-4A with the exception of the communications equipment.

4. The model L-4H, serial number 43-29048 and up, does not have a fixed communications equipment, with the exception of antenna and antenna reel, and is also differentiated by the type of brakes and the windshield attachment.

5. The model L-4J, serial number 44-80045 and up, is identical to the model L-4H except that the model L-4J is equipped with a Roby manually controlled, adjustable pitch propeller.

~~RESTRICTED~~

AN 01-140DA-2

HANDBOOK

ERECTION AND MAINTENANCE INSTRUCTIONS

USAF SERIES

L-4A, L-4B, L-4H, AND L-4J

AIRCRAFT

REVISION NOTICE

LATEST REVISED PAGES SUPERSEDE THE SAME PAGES OF PREVIOUS DATE

Insert revised pages into basic publication. Destroy superseded pages.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE
AND THE CHIEF OF THE BUREAU OF AERONAUTICS

~~RESTRICTED~~

WF-O-23 MAR 48 2M

25 AUGUST 1943
REVISED 1 MARCH 1948

LIST OF REVISED PAGES ISSUED

INSERT LATEST REVISED PAGES. DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the current revision is indicated by a vertical line in the outer margins of the page.

Page No.	*Date of Latest Revision*
iv	5 March 1945
1	25 July 1947
2	25 July 1947
7	5 March 1945
8	5 March 1945
8A	5 March 1945
8B	5 March 1945
*16	1 March 1948
17	5 March 1945
30	30 July 1945
34	25 July 1947
37	20 June 1945

* The asterisk indicates pages revised, added or deleted by the current revision.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS: USAF

USAF ACTIVITIES.—In accordance with Technical Order No. 00-5-2.

NAVY ACTIVITIES.—Submit request to nearest supply point listed below, using form NavAer-140: NAS, Alameda, Calif.; ASD, Orote, Guam; NAS, Jacksonville, Fla.; NAS, Norfolk, Va.; NASD, Oahu; NASD, Philadelphia, Pa.; NAS, San Diego, Calif.; NAS, Seattle, Wash.

For listing of available material and details of distribution see Naval Aeronautics Publications Index NavAer 00-500.

SECTION I
DESCRIPTION, DIMENSIONS, AND LEADING PARTICULARS

1. GENERAL.

(See figures 1, 2, and 3.)

The L-4A, L-4B, L-4H, and L-4J airplanes are manufactured by Piper Aircraft Corporation, Lock Haven, Pennsylvania. With a few exceptions which are herein noted, they are identical; consequently, all parts of this handbook will apply to all models unless otherwise specified.

2. DESCRIPTION.

a. TYPE.—Two-place, closed, land monoplane.

(1) Models L-4A and L-4B have a gross weight of 1170 pounds each.

(2) Models L-4H and L-4J have a gross weight of 1220 pounds each.

b. ENGINE INSTALLATION.—Single engine in nose of fuselage.

c. WING.—Strut-braced; two-spar; cloth-covered; U.S.A. 35B-airfoil.

d. FUSELAGE.—Welded steel tubing, cloth-covered, door on right side of cockpit.

e. CHASSIS.—Main gear split-axle type, rubber cord shock absorber. Low-pressure tires, hydraulic brakes, steerable tail wheel with solid tire.

f. CONTROL SYSTEMS.—Dual control sticks and dual rudder pedals with cable connections between control surfaces and cockpit. Instrument panel control for cabin heater. Throttle, fuel shut-off on left side of cockpit. Carburetor heat control on right side of cockpit below enclosure door.

(1) The model L-4A has ignition switch, receiver, and remote control panel on upper left side of cockpit; radio transmitter on desk; master switch box on floor between front and rear seats.

(2) In the model L-4B the ignition switch is on the upper left side of cockpit. In the models L-4H and L-4J the ignition switch is in upper right of cockpit. The models L-4H and L-4J have antenna reels installed in the upper left rear of the cockpit.

3. PRINCIPAL DIMENSIONS.

a. GENERAL.—Span, 35 feet, 2½ inches; length (overall), 22 feet, 4½ inches; length (tail wheel on ground), 21 feet; height (level flight-rudder), 9½ feet; height (tail wheel on ground, prop blade vertical at top), 8½ feet.

b. WINGS.—Airfoil section (curve identification), U.S.A. 35-B; chord, at root, 5 feet, 3 inches; chord near tip (16 feet from fuselage center line), 5 feet, 3 inches; incidence (root), 1 degree, 37 minutes; (tip), 47 minutes; dihedral. (See figure 6, Rigging Diagram.)

c. STABILIZER.—Span, 9 feet, 6 inches; maximum chord, 46-1/16 inches; incidence (variable), plus or minus 2 degrees, 30 minutes.

d. FUSELAGE.—Width (maximum), 2 feet, 3¾ inches; height (maximum), 4 feet, 1½ inches; length (rudder installed—without engine mount), 20 feet; length (rudder installed—with engine mount), 20 feet, 9 inches.

e. AREAS. — Wings (less ailerons), 169.3 square feet; ailerons (total), 19.2 square feet; stabilizer (including elevators), 25.30 square feet; elevators, 10.65 square feet; fin, 4.02 square feet; rudder, 6.55 square feet.

4. LEADING PARTICULARS.

a. CONTROL SURFACES.—Settings and ranges of movement follow:

(1) AILERONS. — "Up" travel (degrees from neutral), 18 degrees; "Down" travel (degrees from neutral), 18 degrees.

(2) ELEVATORS.—"Up" travel (degrees from streamline with stabilizer), 34 degrees; "Down" travel (degrees from streamline with stabilizer), 27 degrees.

(3) STABILIZER.—"Up" travel (inches and degrees from neutral), 1½ inches, 2 degrees, 30 minutes; "Down" travel (inches and degrees from neutral), 1½ inches, 2 degrees, 30 minutes.

(4) RUDDER. — "Right" travel (degrees from vertical fin streamline), 30 degrees; "left" travel (degrees from vertical fin streamline), 30 degrees.

b. LANDING GEAR.—Split-axle, fixed type.

(1) TREAD.—Width from center of tread to center of tread, 5 feet, 11 inches.

(2) SHOCK STRUTS.—Shock cord and telescoping steel tubes.

(3) WHEELS.—Hayes model 84 with Schenuit "Cub" smooth tread 8.00 x 4 tires.

(a) Sixteen pounds air pressure per square inch used in the tires on the models L-4A and L-4B with gross weight of 1170 pounds.

(b) Sixteen pounds air pressure per square inch used in the tires on the models L-4H and L-4J with gross weight of 1220 pounds.

(4) BRAKES.

(a) Stevens master cylinder hydraulic brakes used on the models L-4A and L-4B.

(b) Scott-type B711 master cylinder hydraulic brakes used on the model L-4H.

(5) TAIL WHEEL.—Fixed suspension, steerable.

(a) Air Associates "Cub" used on the model L-4A with two-leaf steel spring suspension.

(b) Scott-type CST-12 used on the model L-4B with two-leaf steel spring suspension.

(c) Scott-type 3-21 used on the model L-4H with three-leaf steel spring suspension.

SECTION II

SHIPMENT AND ERECTION PROCEDURE (ASSEMBLY AND DISASSEMBLY OF MAJOR COMPONENT PARTS)

1. SHIPMENT OF AIRCRAFT.

Methods of delivery of the airplane are as follows:

a. Completely assembled for fly-away delivery.

b. Disassembled and racked in box cars.

c. Disassembled and crated. The dimensions of the crates are:

Length	21 feet, 7 inches
Height	6 feet, 9 inches
Width	4 feet, 11 inches
Packing Space	716 cubic feet

One complete airplane is contained in each crate.

2. ERECTION PROCEDURE.

a. LANDING GEAR AND TAIL WHEEL. *(See figure 4.)*

(1) Place padded "horse" of sufficient height crosswise under the covered fuselage aft of the rear landing-gear fittings.

(2) Install cabane vee and shock strut assembly to fuselage.

NOTE

On the model L-4A, the generator attachment brackets are installed to cabane vee with AN6-20 bolts, two AN960-616 washers, AN310-6 aircraft castle nuts, AN380-3-3 cotter pins. (See figure 5 for recommended drawing tension.) Cabane vee and shock strut assemblies are installed with these same installation parts. The model L-4B and L-4H do not have a generator, so the cabane vee and shock strut assemblies use AN6-16 instead of AN6-20 noted above. All other parts are as noted above.

(a) Put AN4-20 bolts through cabane vee and fuselage fittings, heads forward.

(b) Use one AN960-416 washer, one AN310-4 aircraft castle nut, one AN380-2-2 cotter pin on each bolt. (See figure 5 for recommended drawing tension.)

(3) Install left landing-gear vee to fuselage.

(a) Put AN6-26 bolts through landing gear and fuselage fittings, heads forward.

(b) Use one AN960-616 washer, one AN310-6 aircraft castle nut, one AN380-3-3 cotter pin on each bolt. (See figure 5 for recommended drawing tension.)

(4) Install left landing-gear vee to shock strut assembly.

(a) Models L-4A and L-4B, use one AN6-17 bolt, one AN960-616 washer, one AN310-6 aircraft castle nut, one AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(b) Model L-4H only, use one AN6-20 bolt, two AN960-616 washers, one AN310-6 aircraft castle nut, one AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(5) Install right landing-gear vee and entrance step to fuselage.

Location	*Foot-pounds*
Engine to engine mount (4 bolts)	4-6
Engine mount to fuselage (4 bolts)	20-30
Left landing-gear vee to fuselage (2 bolts)	11
Right landing-gear vee to fuselage (2 bolts)	11
Cabane vee to fuselage (2 bolts)	8
Shock struts to cabane vee (2 bolts)	10-11
Shock strut to left axle (1 bolt)	10
Shock strut to right axle (1 bolt)	10
Steerable tail wheel to spring (1 bolt)	20-35
Tail wheel spring to fuselage (1 bolt)	15-18
Tail wheel spring "U"-bracket	8-10

Location	*Foot-pounds*
Wing root rear hinge bolt (L & R)	5-6
Wing root front hinge bolt (L & R)	6-7
Front lift strut to spar fitting (L & R) 1 bolt	3-5
Rear lift strut to spar fitting (L & R) 1 bolt	3-5
Front and rear lift strut to fuselage bolts (L & R) 2 bolts	3
Elevator upper connector link (upper bolt)	1
Elevator upper connector link (lower bolt)	5
Stabilizer to adjustment control (L & R) 1 bolt	2
Stabilizer to fuselage link tube	2
Propeller to hub (6 bolts)	19

Figure 5—Torque Tension Chart

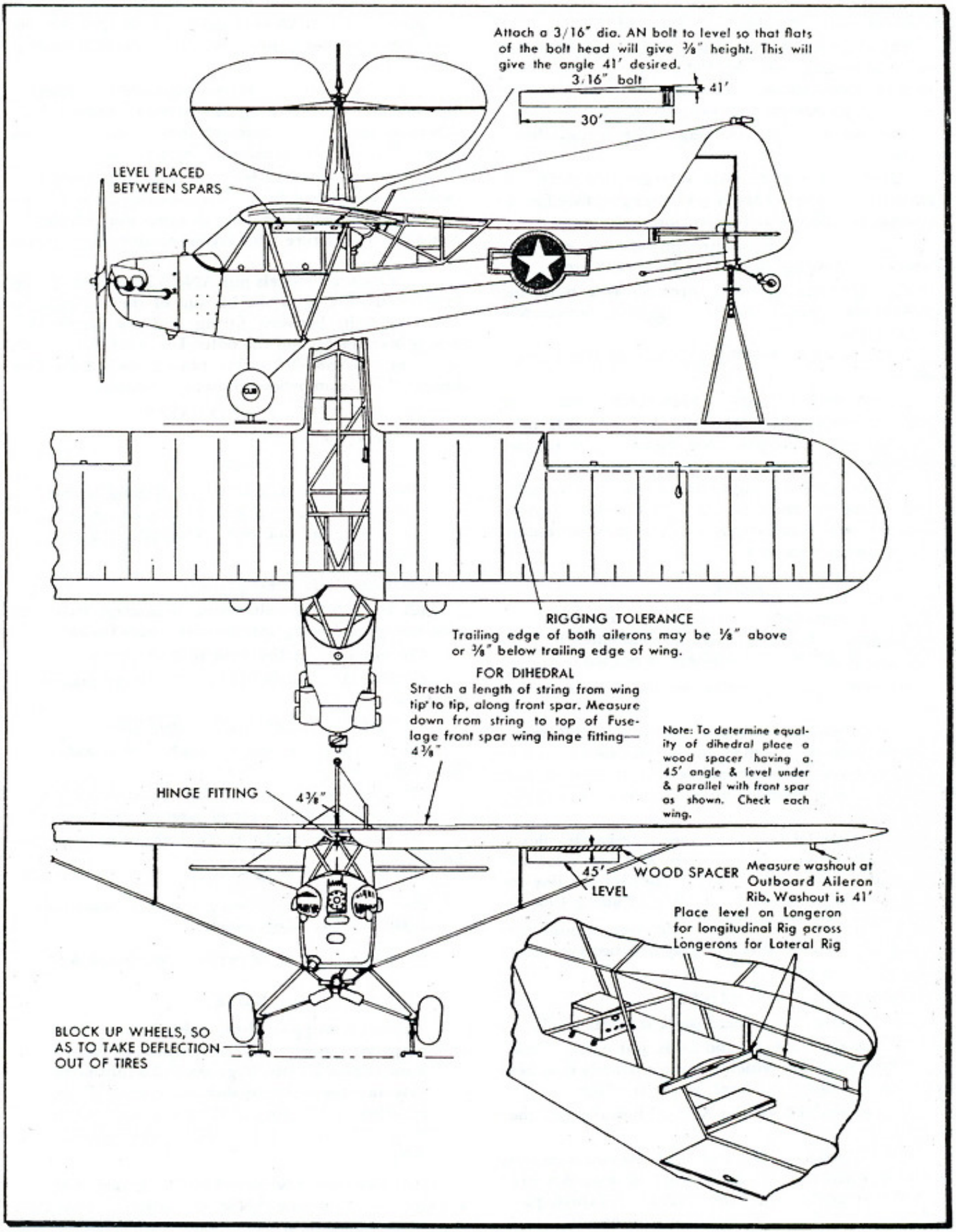


Figure 6—Rigging Diagram

(a) Put AN6-26 bolt through landing-gear vee and fuselage front fitting, head forward.

(b) Use one AN960-616 washer, one AN310-6 aircraft castle nut, one AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(c) Put AN6-27 bolt through landing-gear fitting, entrance step, and fuselage rear fitting, head forward.

(d) Use two AN960-616 washers, one AN310-6 aircraft castle nut, one AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(e) Put AN3-5 boot through entrance step lug and clamp on fuselage longeron, head outward.

(f) Use one AN310-3 aircraft castle nut, one AN380-2-2 cotter pin. Draw nut snug, no recommended drawing tension.

(6) Install right landing-gear vee to shock strut assembly.

(a) Model L-4H only, use one AN6-20 bolt, two AN960-616 washers, one AN310-6 aircraft castle nut, one AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(b) Models L-4A and L-4B, use one AN6-17 bolt, one AN960-616 washer, one AN310-6 aircraft castle nut, one AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

NOTE

Space between landing-gear male fittings and fuselage female fittings may be eliminated by the use of AN960-616 washers as needed.

(7) Connect brake lines to flexible hoses at brake cylinders.

(a) On models L-4A and L-4B, a 6-inch Resistoflex flexible hose with a male fitting on one end and a female fitting on the other end is used to connect the line to the master cylinder on each side. (See Tubing Chart, figure 24.)

(b) On model L-4H an 11-inch Resistoflex flexible hose with a male fitting on one end and a female fitting on the other end is used to connect the line to the master cylinder on each side. (See Tubing Chart.)

(8) INSTALL WHEELS.—Axle nut should be tightened to the extent that end play of wheels on axles is removed. Safety nut.

(9) INSTALL TAIL WHEEL.

(a) Remove "horse" and place it under fuselage.

(b) On models L-4A and L-4B, put AN6-20 bolt through hole in fitting which is approximately 6 inches forward of the tail post, head inside fuselage.

(c) On model L-4H put AN6-23 bolt through the above hole.

(d) On models L-4A and L-4B the steerable tail wheel is attached to the long spring leaf with AN6-11 bolt, AN310-6 aircraft castle nut, AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(e) On models L-4A and L-4B place short spring leaf over long leaf and fit over bolt as in paragraph *(b)*, preceding. Use AN310-6 aircraft castle nut, AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(f) On model L-4H the steerable tail wheel is attached to the two long leaves with AN6-13 bolt, AN310-6 aircraft castle nut, AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(g) On model L-4H place short spring leaf over two long leaves and fit over bolt as in paragraph *(c)*, preceding. Use AN310-6 aircraft castle nut, AN380-3-3 cotter pin. (See figure 5 for recommended drawing tension.)

(h) On all models put AN4-6 bolts through the holes in the fitting at the bottom of the tail post; fit pad over bolts between fitting and spring; fit "U" fitting over spring and the bolts. Use AN310-4 aircraft castle nut, AN380-2-2 cotter pin on each bolt. (See figure 5 for recommended drawing tension.)

b. WINGS, STRUTS, AND CABLES.

(See figure 4.)

NOTE

Three men are needed to install wing panels to fuselage: one man at wing tip, one man at wing root, and one man to install wing root hinge bolts.

(1) Install left wing panel.

(2) Put AN5-16 bolts through fuselage front and rear fittings and wing spar fittings, heads forward.

(3) Install front lift strut to spar fitting.

(4) Put AN5-17 bolt through fitting and strut, head forward.

(5) Install rear lift strut to spar fitting.

(6) Put AN5-14 bolt through fitting and strut, head forward.

(7) Raise wing tip and slip lift strut fork ends over lift strut fitting at rear of landing gear vee.

(8) Put special bolts (82141) through forks and fitting.

NOTE

Procedure for right wing panel is same as listed for left wing panel.

(9) Check rigging of wings. (See figure 6.)

NOTE

Airplanes shipped disassembled have been properly rigged and test-hopped at factory prior to disassembly. Rigging and adjustments have not been altered during process of disassembly and crating. Any changes in adjustments will necessitate rerigging and test-hopping.

(10) Put two AN960-516 washers, one AN310-5 aircraft castle nut, one AN380-2-2 cotter pin on each wing root hinge bolt. (See figure 5 for drawing tension.)

(11) Place bushing (80022-52) inside of bushing (80022-65) on front spar fitting bolt (paragraph [4], preceding). These two bushings are now replaced by one bushing (82732-22). 82732-22 is interchangeable with one each of 80022-52 and 80022-65.

(12) Install pulley bracket assembly on bolt (paragraph [4], preceding).

(13) Use AN310-5 aircraft castle nut, AN380-2-2 cotter pin. (See figure 5 for drawing tension.)

(14) Use AN960-516 washer, AN310-5 aircraft castle nut, AN380-2-2 cotter pin on rear spar fitting bolt (paragraph [6], preceding). (See figure 5 for drawing tension.)

(15) Use AN320-5 shear nut, AN380-2-2 cotter pin on each strut fork bolt (paragraph [8], preceding). (See figure 5 for drawing tension.)

(16) Install jury struts.

NOTE

Jury strut with pitot tube is installed on left side. Bolt, nut, washer, and cotter pin sizes are the same for left and right installations.

(17) Attach front and rear jury struts to spar fitting.

(18) Put AN3-4 bolt through fitting and jury strut, head forward fuselage.

(19) Use AN960-10 washer, AN310-3 aircraft castle nut, AN380-2-2 cotter pin on each bolt. No drawing tension recommended, normal drawing sufficient.

(20) Install clamps on lift struts.

(21) Use small round clamps between ends of strut clamps.

(22) Put AN-3-12 bolts through strut clamps and round clamps.

(23) Use AN960-10 washer, AN310-3 aircraft castle nut, AN380-2-2 cotter pin on each bolt. No drawing tension recommended, normal drawing sufficient.

(24) Install jury strut spacer tube.

(25) Put AN3-5 bolts through jury struts, jury strut spacer tubes, and round clamps.

(26) Use AN960-10 washer, AN310-3 aircraft castle nut, AN380-2-2 cotter pin on each bolt. No drawing tension recommended, normal drawing sufficient.

(27) Connect air-speed line to jury strut pitot line with 1½ inch piece of 3/16-inch inside diameter rubber tubing.

(28) Install cables and pulleys. (See figure 25.)

NOTE

Cable to lower aileron horn is in wing, ends are bolted together inside cockpit; use two AN115-16 shackles, AN3-6 bolt, AN310-3 aircraft castle nut, AN380-2-2 cotter pin. No drawing tension recommended, normal drawing sufficient.

(29) String cables through fair-lead housings on front lift struts.

(30) Install pulleys at spar strut fittings; use AN396-17 pin, AN380-3-3 cotter pin.

(31) Install fiber fair-leads; secure with snap rings.

(32) Install pulleys inside cockpit at floor board.

(33) Connect cables to torque tube horn; use AN115-16 shackles, AN3-6 bolt, AN310-6 aircraft castle nut, AN380-2-2 cotter pin. No drawing tension recommended, normal drawing sufficient.

(34) Pull cable to lower aileron horn through under side of wing, attach turnbuckle to horn; use AN3-5 bolt, AN310-3 aircraft castle nut, AN380-2-2 cotter pin. No drawing tension recommended, normal drawing sufficient.

AN3-5 bolt has been replaced by AN23-12 clevis bolt. Draw nut to end of threads on the clevis bolt and safety.

NOTE

See that turnbuckle moves freely on aileron horn at all times.

(35) Pull cable to upper aileron horn through wing. (Refer to paragraph 29, preceding.)

(36) Install pulley in upper wing bracket; use AN4-14 bolt, AN310-4 aircraft castle nut, AN380-2-2 cotter pin. No drawing tension recommended, normal drawing sufficient.

(37) Connect turnbuckle to upper horn; use AN3-5 bolt, AN310-3 aircraft castle nut, AN380-2-2 cotter pin on each nut. No drawing tension recommended, normal drawing sufficient. AN3-5 bolt has been replaced by AN23-12 clevis bolt. Draw nut to end of threads on clevis bolt and safety.

(38) Check cables for tension.

NOTE

Cables that are too tight make stick action very stiff; cables that are too loose make stick action too free and uncertain; cables should not slap nor wobble when stick is moved back and forth several times in rapid succession.

(39) After all wing hinge bolts have been installed and safetied, wing root gap covers are installed. Use size 4-36 x ½-inch machine screws and speed nuts at the fuselage side and No. 4 Parker-Kalon screws at the wing side, on models L-4A and L-4B. On model L-4H, use 3/32 x ½ brazier-head rivets and 1597-M-1 Tinnerman speed nuts. Install the leading edge plates (center section), use 6-32 elastic stop nuts at top deck, and No. 4 Parker-Kalon screws at wing on models L-4A and L-4B. On model L-4H use 3/32 x ½ brazier-head rivets and 1597-M-1 Tinnerman speed nuts at the top deck and No. 4 Parker-Kalon screws at wing.

c. TAIL SURFACES INSTALLATION. *(See figure 4.)*

(1) Install stabilizer sections.

(2) Clean liner tube, 16 inches long, lubricate with cup grease, AAF Specification No. 3560, medium (thin film); insert through stabilizer adjustment yoke.

NOTE

Liner tube removed from disassembly and placed in cockpit.

(3) Install leading edge of left stabilizer section; use AN3-13 bolt, AN310-3 aircraft castle nut, AN380-2-2 cotter pin. (See figure 5 for drawing tension.)

NOTE

To differentiate between left and right stabilizers and elevators, drain grommets are located on under side of these surfaces.

(4) Clean liner tube, 9 inches long (not removed for disassembly); lubricate with cup grease, AAF Specification No. 3560, medium (thin film) replace in fuselage fitting.

(5) Install trailing edge of left stabilizer; use AN3-12 bolt, AN310-3 aircraft castle nut, AN380-2-2 cotter pin. (See figure 5 for drawing tension.)

(6) Install right stabilizer section; use procedure in paragraphs (3) and (5), preceding.

(7) Install stabilizer brace wires.

(8) At fin use two special formed square washers; AN4-15 bolt, AN310-5 aircraft castle nut, AN380-2-2 cotter pin. No recommended drawing tension, normal drawing sufficient.

(9) At stabilizer trailing edge, use AN3-15 bolts, two small bushings, AN310-3 aircraft castle nuts, AN380-2-2 cotter pins. No recommended drawing tension, normal drawing sufficient.

(10) At lower fuselage fittings, use AN3-5 bolts, AN310-3 aircraft castle nuts, AN380-2-2 cotter pins. No recommended drawing tension, normal drawing sufficient.

(11) Check stabilizer for lateral level; tolerance is plus or minus 30 minutes.

(12) Install elevators. (See note under paragraph [3], preceding.)

(13) Use AN394-55 pins, AN380-2-2 cotter pins, ½-inch outside diameter washers. Additional washers may be used between fittings to eliminate possible end play.

(14) Connect lower cable and link to lower elevator horn, use AN3-6 bolt, AN310-3 aircraft castle nut, AN380-2-2 cotter pin. No recommended drawing tension, normal drawing sufficient.

(15) Connect upper cable and link to upper elevator horn, use AN3-5 bolt, AN310-3 aircraft castle nut, AN380-2-2 cotter pin in upper hole. No recommended drawing tension, normal drawing sufficient.

(16) Use AN4-6 bolt, AN310-4 aircraft castle nut, AN380-2-2 cotter pin in lower hole. No recommended drawing tension, normal tension sufficient.

(17) Install rudder; use AN394-55 pins, AN380-2-2 cotter pins, ½-inch outside diameter washers. Washers may be used between fittings to eliminate end play.

(18) Connect cables to rudder horns; use AN23-12 clevis bolt, AN960-10 washer, AN310-3 aircraft castle nut, AN380-2-2 cotter pin at each horn. Draw nut to end of thread and safety.

NOTE

See that turnbuckles move freely on rudder horns at all times.

(19) Connect rubber shock cords to rudder and tail wheel connections. On Contract W 535 ac-36506, steel connector springs are used in place of the rubber shock cords.

d. RIGGING PROCEDURE. *(See figure 6.)*

(1) DIHEDRAL ANGLE.—To check the dihedral angle at the front spar, proceed as follows:

(a) Stretch a string along the top of the wings above the front spar, from wing tip to wing tip, and draw it tight.

(b) Check the dimension vertically from the front edge of the center section to the string. For correct dihedral this dimension should be 4⅜ inches plus or minus ⅛-inch. Obtain this dimension by adjusting the front struts in or out.

(2) To check for equal dihedral in each wing, proceed as follows:

(a) Using the 30-inch level (without any spacer blocks), hold it spanwise against the bottom of the wing under the front spar in the space between the jury struts and lift strut attachments. Note the position of the bubble and do the same on the other wing.

(b) Readjust the front struts until both wings show the same amount of off-level, being careful with each adjustment to set the left strut out the same number of turns as the right one is set in, and vice versa.

(3) WASHOUT.—To adjust the washout in the wings (dihedral of the rear spar), proceed as follows:

(a) Set a ⅜-inch spacer block on top of one end of the 30-inch level.

(b) Working on the rib adjacent to the outer end of the aileron, hold the level forward and aft along the bottom of the rib with the spacer block at the rear and the front end at the location of the front spar. The correct washout will exist when the bubble is centered. Adjust the rear struts in or out to obtain this condition.

(4) TAIL ASSEMBLY.—With the airplane in level position the stabilizers should be leveled at their rear spars. The hinge line should be straight from tip to tip. Plumb the fin at the rudder hinges.

e. INSTALL PROPELLER. *(See figure 4.)*

(1) Place hub so that keyway points to the number 8 stamped on the propeller.

(2) Insert six bolts through hub and plate with machined side towards propeller.

(3) Grease propeller shaft (thin film). Use AAF Specification No. 3560, medium.

(4) Insert propeller with key and keyway matching.

(5) Tighten hub nut on shaft and safety.

(6) Tighten all bolts through propeller. (See figure

5 for drawing tension.)

(7) Check propeller track; tolerance not to exceed 1/16 inch.

(8) Safety through all bolts with .042 inch brass safety wire.

eA. INSTALL PROPELLER (MODEL L-4J ONLY).

(1) GENERAL.

(a) Prior to shipment, each propeller is assembled for balancing and then balanced. The propeller is then fully assembled, lubricated, and thoroughly tested for proper functioning.

(b) The propeller is shipped with the propeller shaft nut, propeller shaft lock nut, a shaft key, and the control bearing bracket disassembled. Since the lubricant is fully contained within the propeller, there are no seals required around the propeller shaft.

(c) Inspect completely for any damages from handling or shipping. Clean all preservative grease or coating from the propeller hub.

(d) Check the pitch-change mechanism for free operation by turning the ring gear at the base of the propeller hub.

(2) INSTALLATION.

(a) CONTROL ASSEMBLY.

1. The hand crank, 90-degree drive, the control shaft extending through the fire wall to the front of the engine, and its supporting bearings and brackets are already installed in the airplane.

2. Remove the engine cowling.

3. Remove the two AN4-35 crankcase bolts located above and below the propeller shaft. (See figure 6A.)

4. Install the mounting bracket, using the two AN4-35 bolts. Install a washer between each arm and the engine crankcase. (See figure 6A.)

CAUTION

The AN4-35 bolts cannot be drawn tight unless the bracket and washers are installed; therefore, this engine is not in proper adjustment to use any other type propeller.

Note

The ground-off end of the mounting bracket goes to the top.

(b) PROPELLER.

1. Inspect propeller shaft for any nicks or burrs and if any are found, remove by polishing.

2. Install the R000-333 propeller shaft key furnished with the kit and lubricate the shaft with engine oil, Specification No. AN-VV-0-446a, Grade 1065a.

3. Place the propeller on the shaft and push it as far onto the shaft as it will go by hand.

Note

Be sure the key remains properly seated in the propeller keyway.

4. Install propeller shaft nut, using bar and wrench to tighten. Tighten nut to 200 foot-pounds of torque—100-pounds pull on a 2-foot bar. (See figures 6B and 6C.)

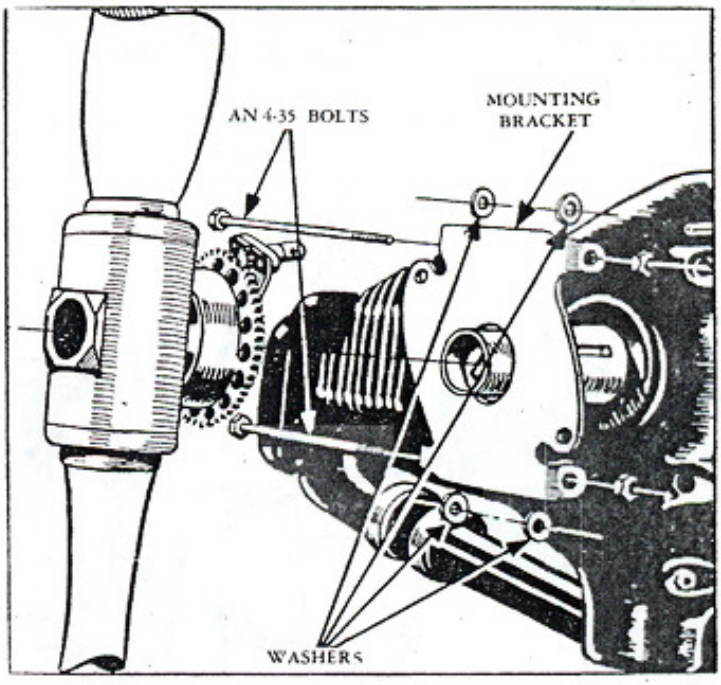


Figure 6A—Pitch Control Mounting Bracket Installation

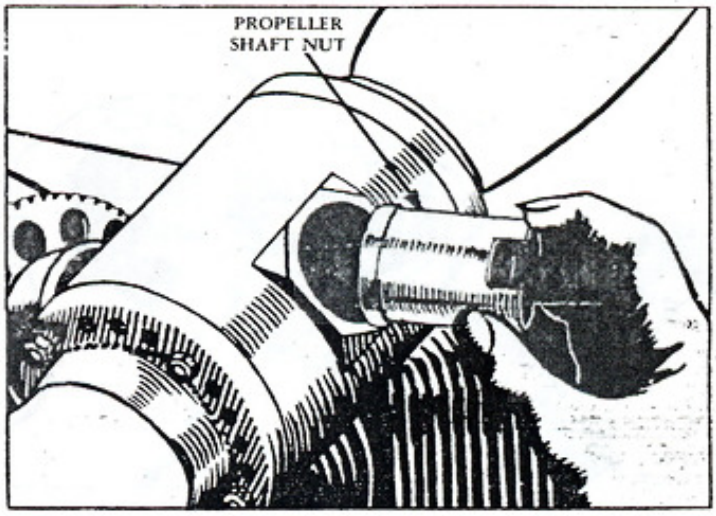


Figure 6B—Inserting Propeller Shaft Nut

5. Install propeller shaft lock nut and tighten with a bar. Align one of the locking pin holes in this lock nut, with the hole in the hub. Install AN392-13 lock pin, AN960-4 washer, and safety with AN380-2-1 cotter pin. (See figures 6D and 6E.)

6. Install the AN392-21 pin that connects the pinion gear universal to the control shaft and safety with AN380-2-1 cotter pin. (See figure 6F.)

7. Check the propeller for free operation of the pitch-change mechanism and control shaft by turning the hand crank. 7½ revolutions of the hand

crank will change the propeller pitch from low rpm to high rpm position. The pitch range is 6 degrees.

8. Check the propeller for track. The blades should align within 1/16 inch of each other.

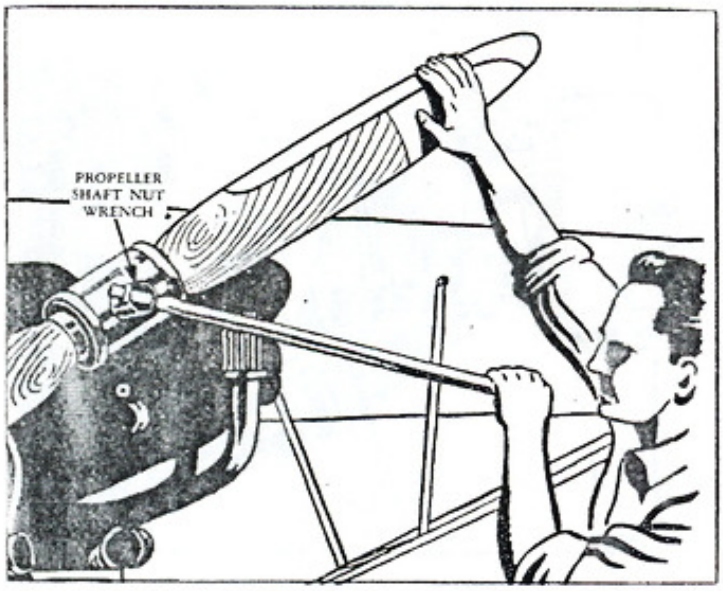
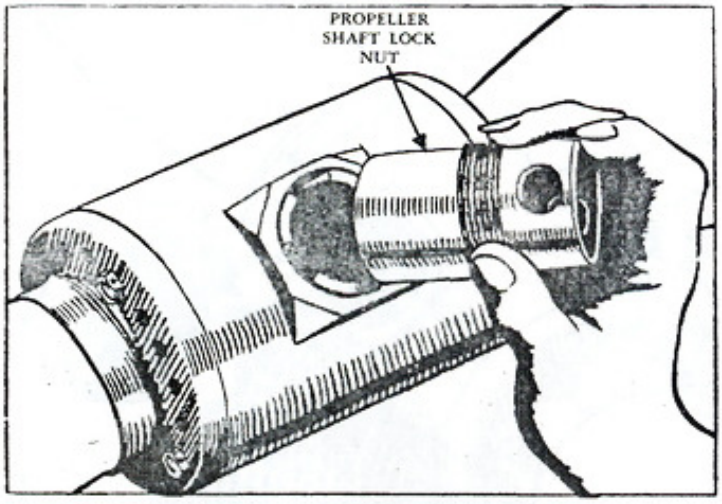


Figure 6C—Tightening Propeller Shaft Nut



rigure 6D—Inserting Propeller Shaft Lock Nut

(3) REMOVAL.

(a) Disconnect the control shaft from the pinion gear universal.

(b) Remove the two AN4-35 bolts through mounting bracket and engine. Remove propeller and attached bracket. Replace AN4-35 bolts. It is not necessary to safety the nuts.

(c) Remove the lock pin from the propeller shaft lock nut.

(d) Loosen the lock nut about two turns.

(e) Using the propeller shaft nut wrench and a bar, loosen the propeller shaft nut. When the nut is backed out against the lock nut, it will act as a puller and will pull the propeller loose from the propeller shaft.

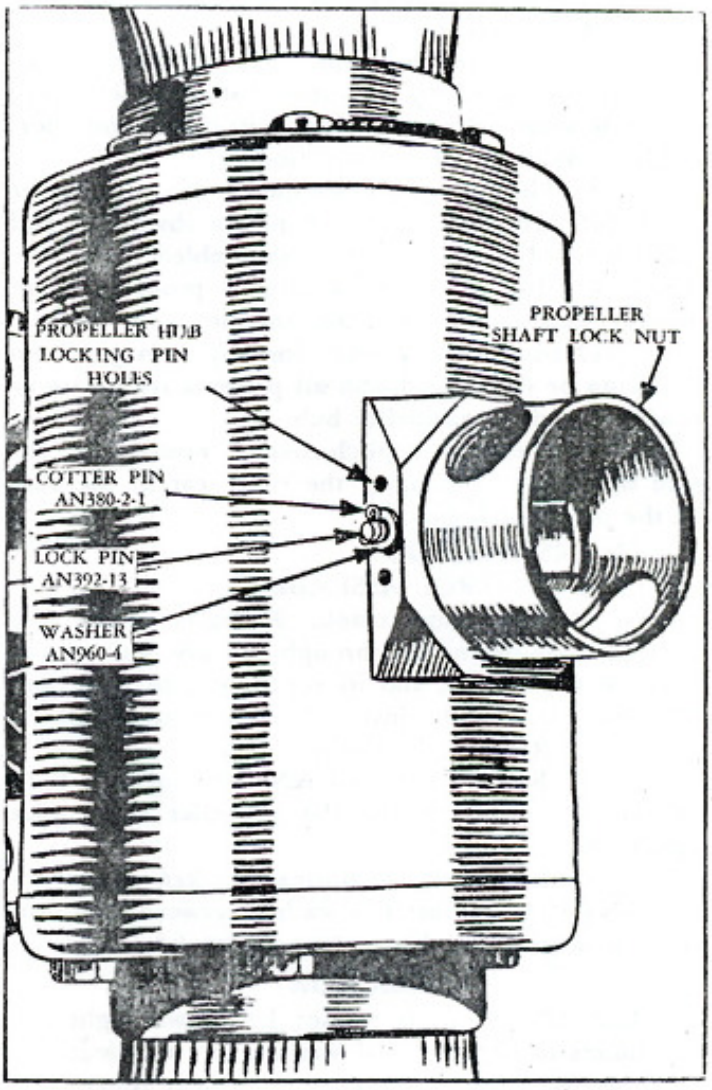


Figure 6E—Safetying Propeller Shaft Lock Nut

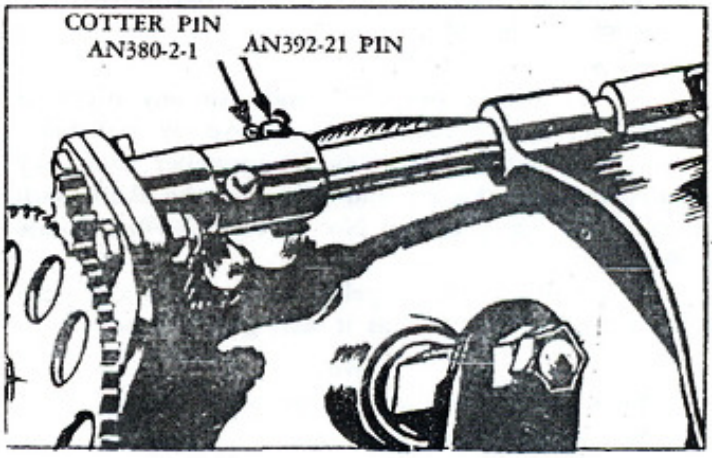


Figure 6F—Pinion Gear, Shaft Connection

(4) STORAGE ON AIRPLANE.

When the airplane is not in use, turn the propeller to the horizontal position. If the propeller is exposed to the weather, protect it with a waterproof cover. Be sure the propeller is left in the low-pitch position. Coat the hub with engine oil, Specification No. AN-VV-0-446a, Grade 1065a.

f. INSTALL BATTERY (L-4A ONLY.)

(1) Fill battery with proper electrolytic solution (specific gravity 1.285); check charge.

(2) Set battery in box, connect terminals.

(3) Check fuses.

g. HOOK UP GENERATOR (L-4A ONLY).

(1) Cable wires are marked so that proper hook-up is facilitated. (Yellow wire to "A" post of generator, black wire to "L" post of generator, blue wire to "B" post of generator housing.)

(2) Turn on generator switch to check operation of generator.

(3) Battery indicator will show whether battery is installed properly.

h. INSTALLATION INSTRUCTIONS FOR RADIO (L-4A).

(1) REMOTE CONTROL PANEL.

(a) Install remote control panel in bracket located to rear of sliding window; use four size 10-32 5/8-inch machine screws in bracket. (See figure 8.)

(b) Run cable from remote control panel down diagonal member to desk. Tape at foot intervals.

Note

All tapes to be shellacked.

(c) Run cable under desk to front of transmitter.

(d) Clamp cable to under side of desk with U-Clamps found in cloth bag.

(e) Bring cable through hole to left of transmitter.

(f) Install coupling connector.

(2) RECEIVER (L-4A). *(See figure 9.)*

(a) Put three shock mounts on receiver case.

Note

Remove receiver from case for this operation.

(b) Installation holes are drilled in top sliding window channel.

(c) Install receiver to channel; use two size 6-32 x 3/4-inch roundhead machine screws, two 6-32 hex nuts.

(d) Install receiver to offset clamp on left top diagonal member; use size 6-32 x 1-inch machine screw and hex nut in clamp.

(e) Hook ground braid to ground stud on right side of receiver case.

(f) Hook antenna lead-in to post marked "ANT" on right side of receiver case.

(g) Put connector tip on end of yellow wire from remote control panel and plug in jack in back of receiver (connector tip in cloth bag.)

(3) TRANSMITTER (L-4A).

(a) Install transmitter to desk; use four size 10-32 x 1 1/8 inch roundhead machine screws, four size 10-32 boot-wing type nuts, four 3/4-inch plain washers. (See figure 10.)

Note

Installation holes are drilled in desk.

(b) Enlarge hole on right side of transmitter so that small connector on power cable can pass through.

(c) Put the two ends of the power cable through this hole.

(d) Run the end with connector attached under the desk parallel to the remote cable up to top diagonal member in front of remote control panel.

(e) Clamp in place; use double clamp found on diagonal member.

(f) Receiver cable connection is made here.

(g) Run cable, without connector, under desk to enclosure door vertical member. (See figure 12.)

(h) Clamp cable to under side of desk. Use U-clamps found in cloth bag.

(i) Tape cable to vertical member down to floor board.

Note

All tapes to be shellacked.

(j) Run cable through cable guard to left side of master control switch box. (See figure 12.)

(k) Pass cable through rubber grommet.

(l) Put terminals, Packard No. 210 or equivalent, on wires.

(m) Fasten blue or positive wire to connection in middle of jumper on terminal strip inside box.

(n) Fasten black or negative wire to ground terminal on same terminal strip.

Note

Ground braid runs from this terminal to side of box.

(4) ANTENNA.

(a) Install entrance fair-lead (fiber tube) to bracket located 13 inches to the rear of remote control panel. Use two Curtiss clamps, bolts, nuts, and lock washers in RCA equipment. (See figure 11.)

Note

Tube should extend at least 6 inches above enclosure.

(b) Put antenna guide fittings on top of entrance fair-lead.

(c) Install rudder post fair-lead. Use clamps attached to rudder.

(d) Install flexible conduit and clamp on reel plate.

(e) Wind antenna wire on reel.

(f) String antenna wire through flexible conduit, entrance fair-lead, tail post fair-lead, and install drag unit. Use swivel and connector ring in RCA equipment.

(g) Install reel on plate.

(h) Hook transmitter lead-in to bolt on side of flexible conduit block.

Note

Make sure that lead-in wire is not grounded at any point.

(5) ALTERNATE ANTENNA INSTALLATION.

(a) In case flexible conduit is not included, do not cut entrance fair-lead; but slide it toward reel until it comes within 1½ inches of reel.

(b) Install bottom guide fitting (RCA equipment) on cockpit end of fair-lead.

(c) Attach transmitter lead-in wire to bottom guide fitting. Use hole drilled in fitting for this purpose.

(6) RECHECK.

(a) Check all wiring connections for tightness.

(b) Check fuses.

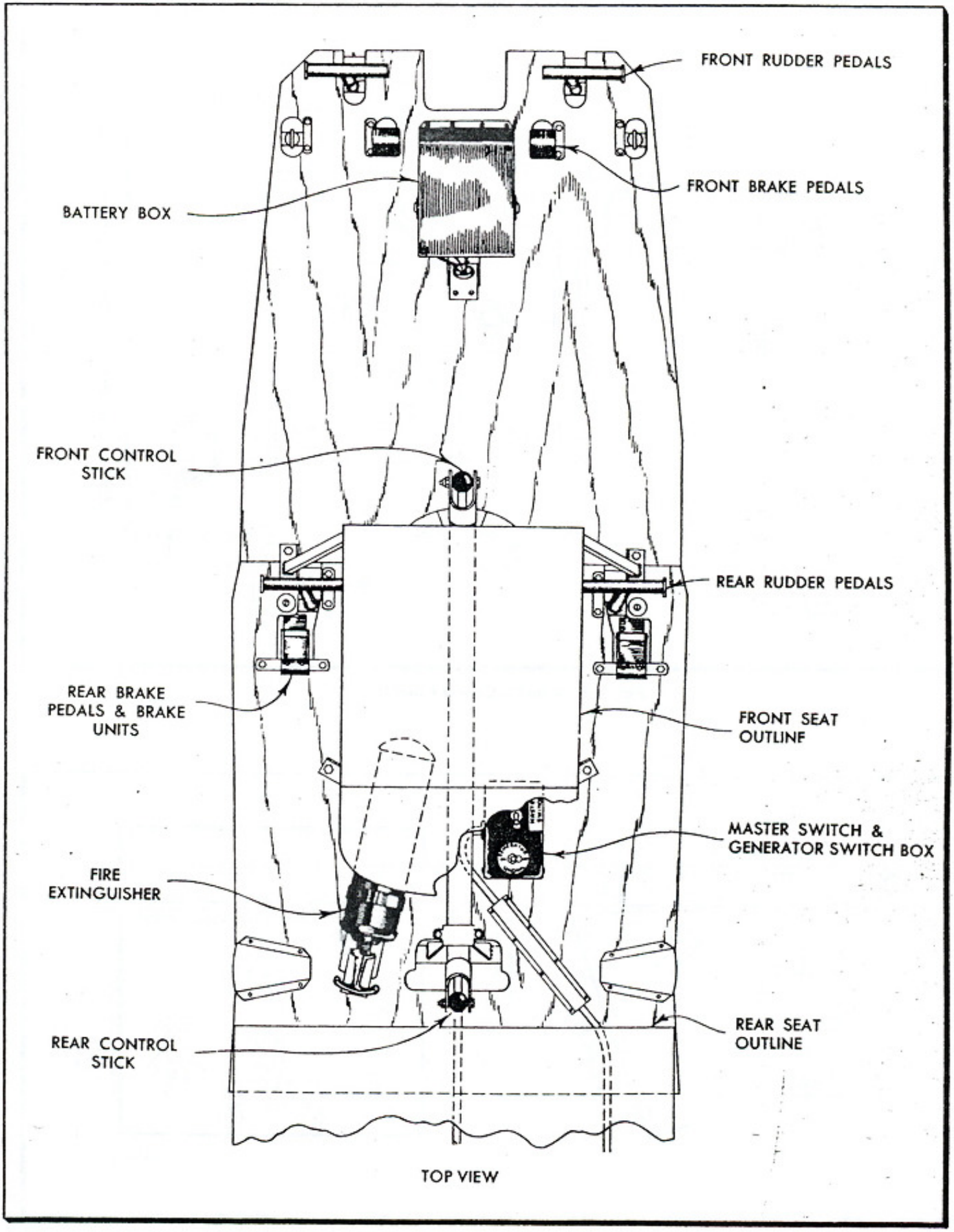


Figure 7—Cockpit Floor (L-4A)

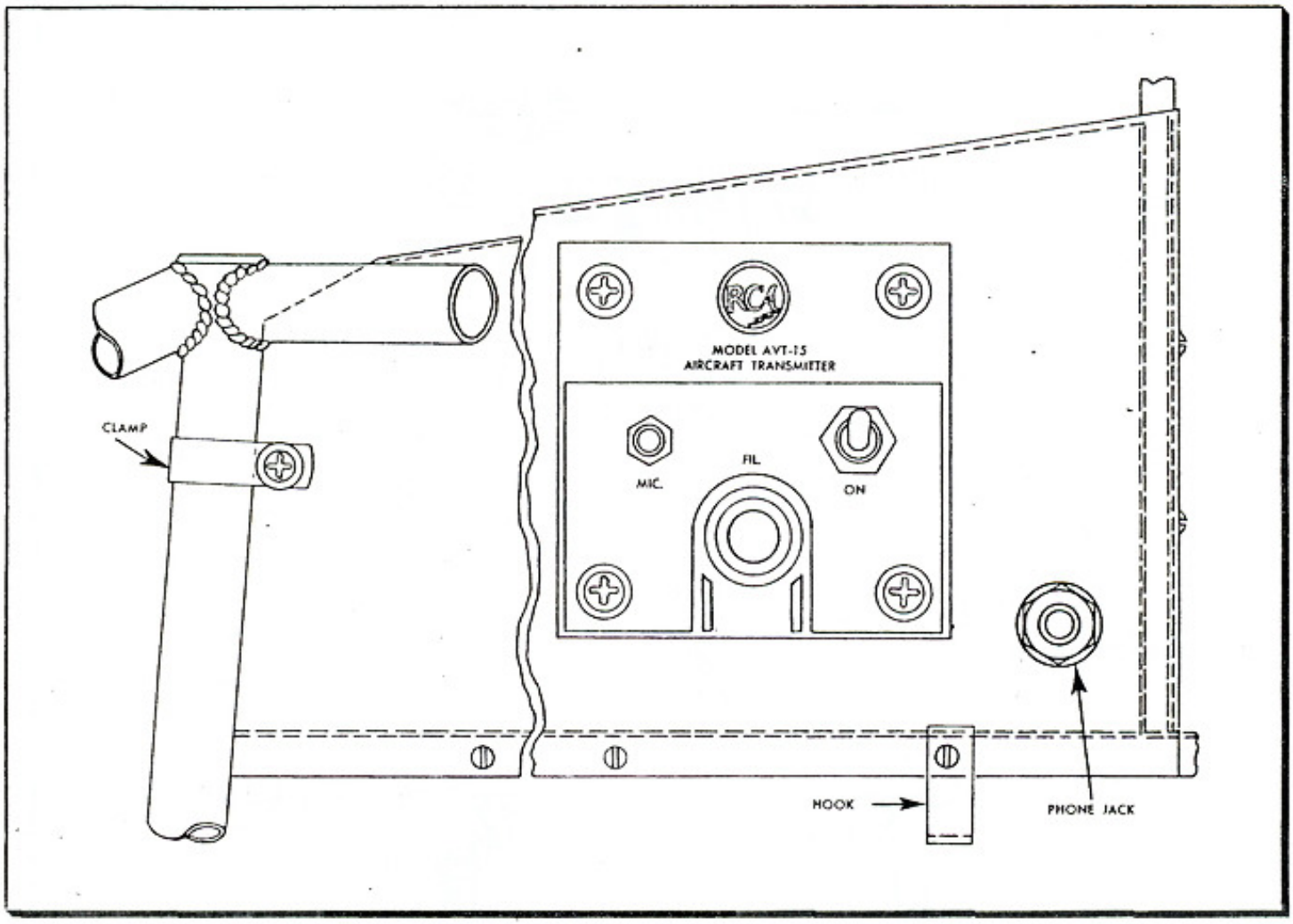


Figure 8—Remote Control Panel (L-4A)

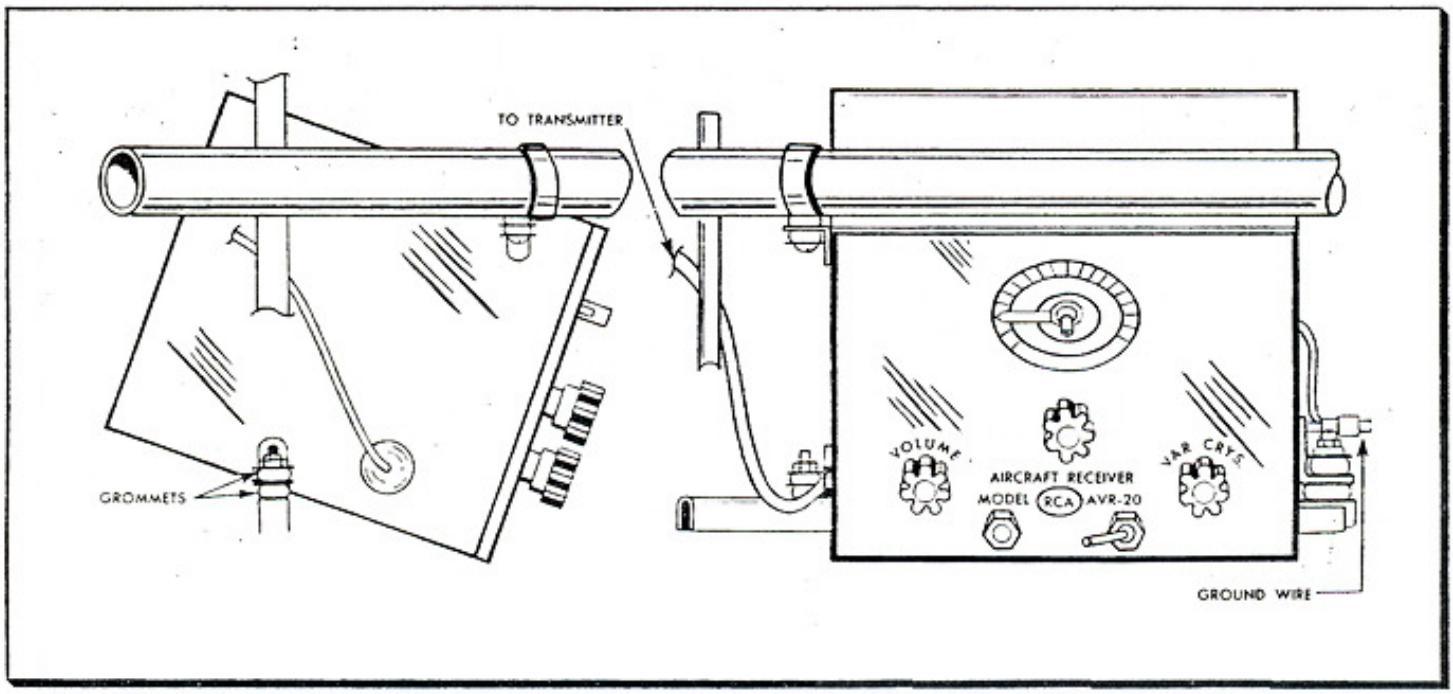


Figure 9—Receiver (L-4A)

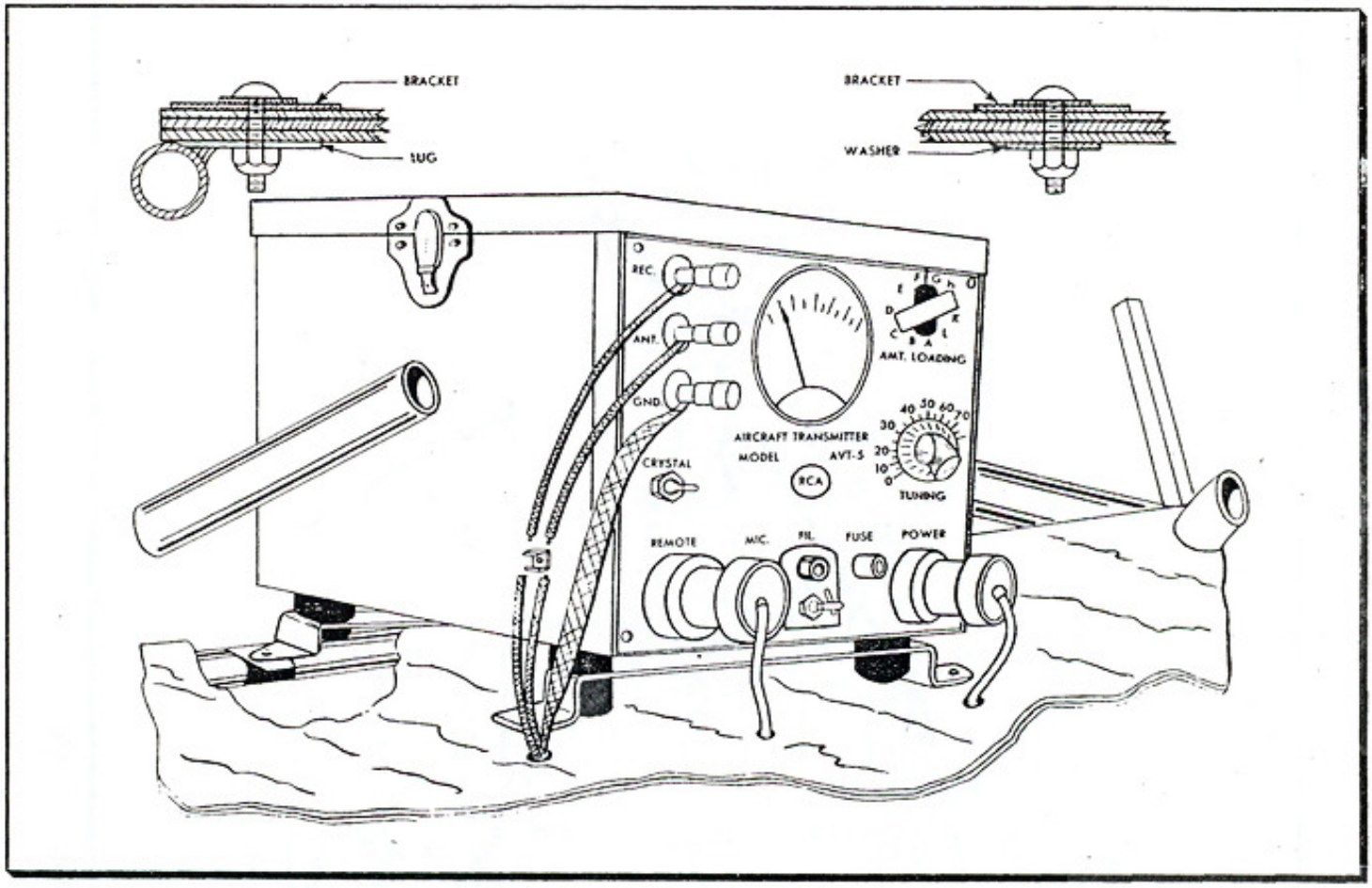


Figure 10—Transmitter (L-4A)

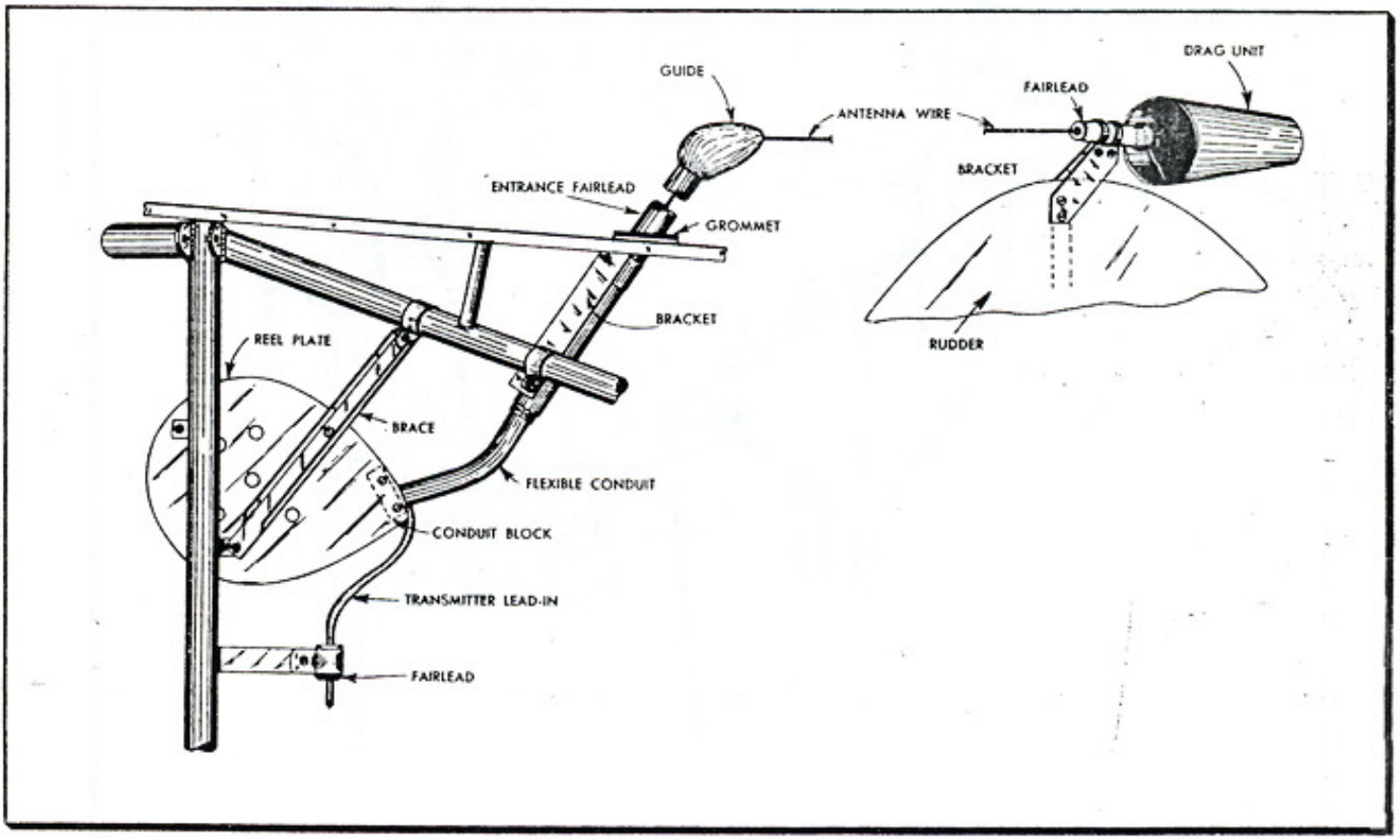


Figure 11—Antenna System (L-4A)

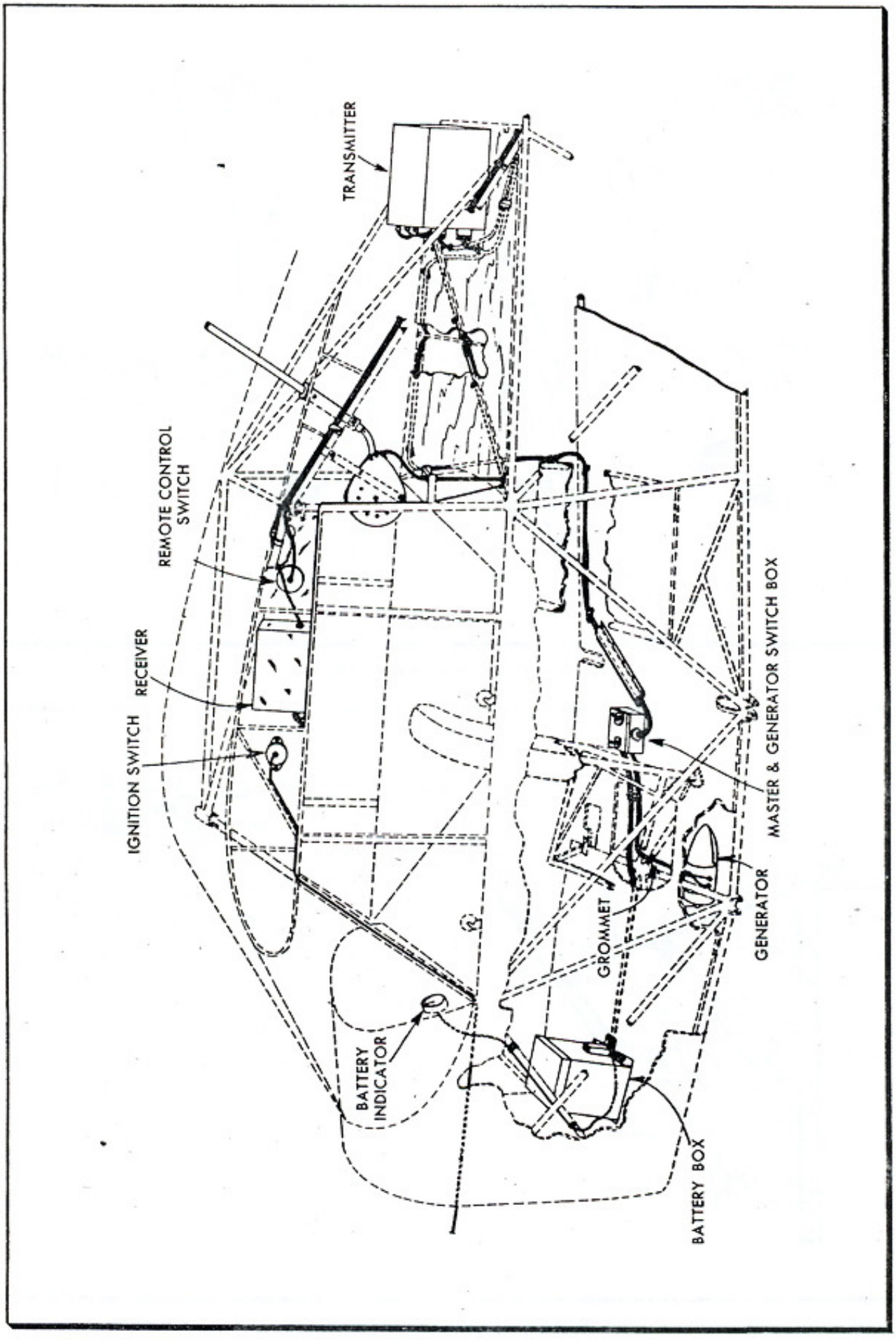


Figure 12—Wiring Diagram (L-4A)

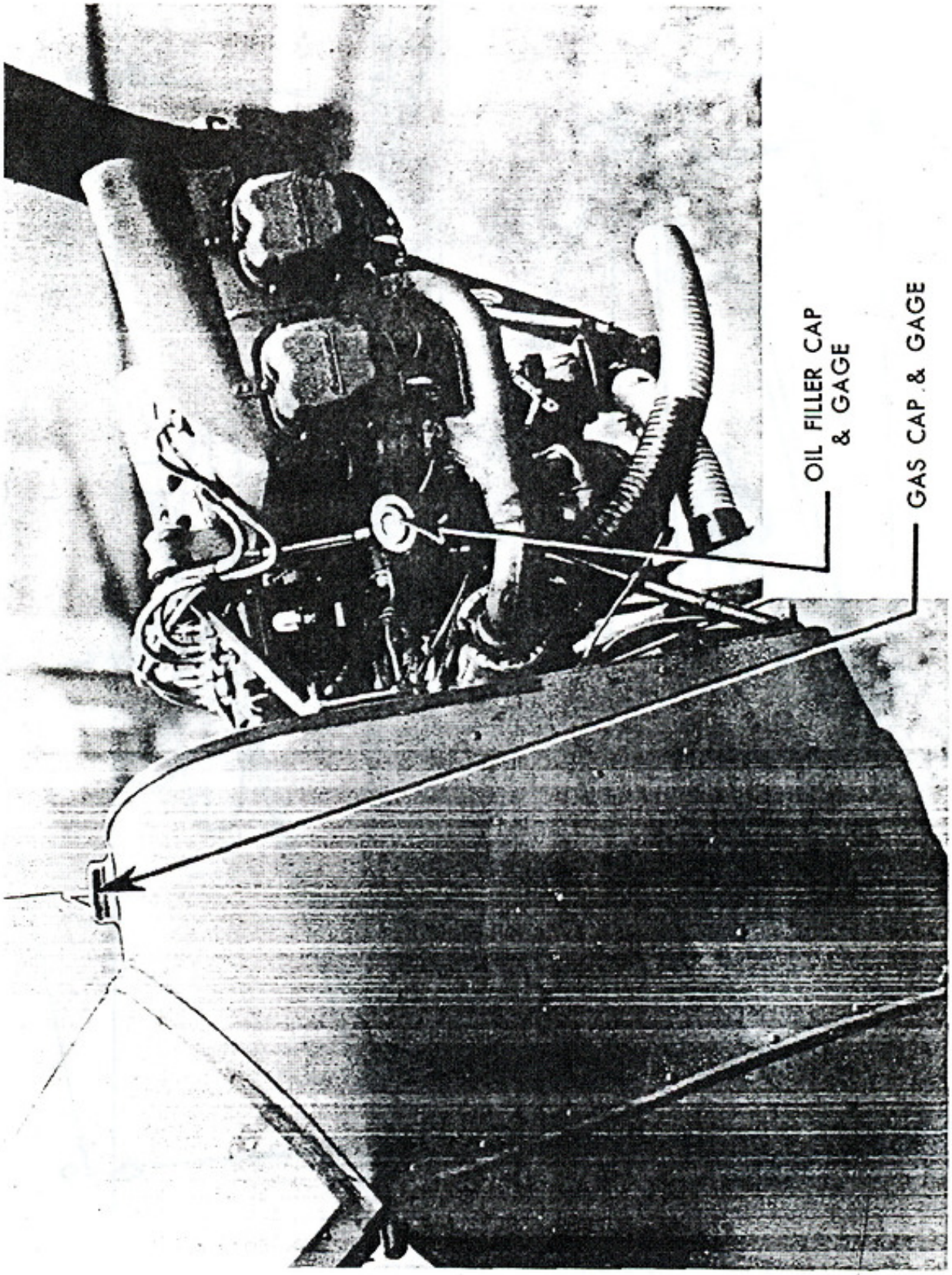


Figure 13—Engine

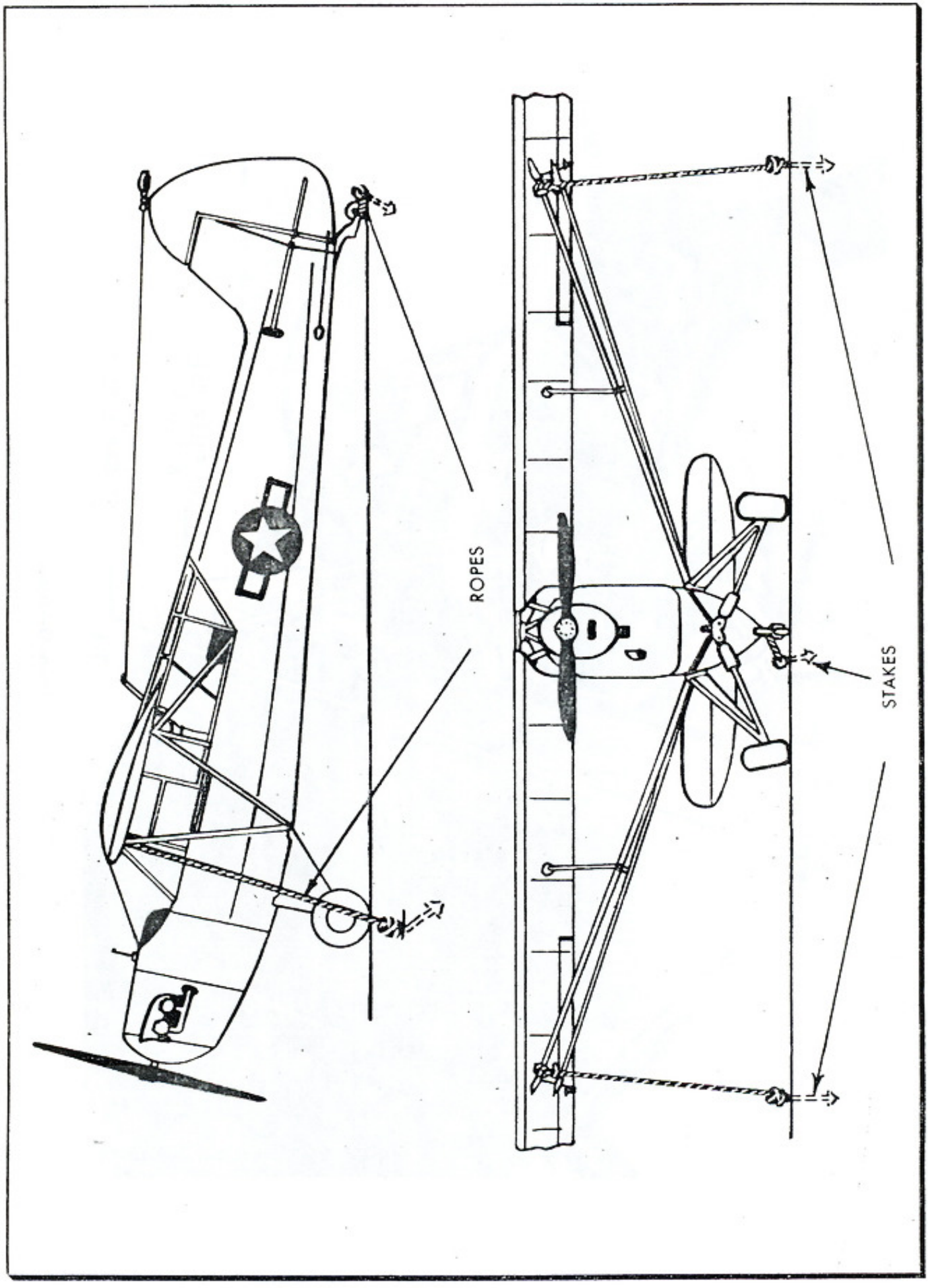


Figure 14—Tie-down of Plane

SECTION III
HANDLING AND GENERAL MAINTENANCE INSTRUCTIONS

1. ACCESS AND INSPECTION PROVISIONS.

NOTE

During manufacture, all necessary provisions for access and inspection are incorporated in the airplane. (See figure 15.)

a. WINGS.—Round inspection openings, one to eight inclusive, on each wing are found on the delivered airplane covered with fabric. Fabric is to be cut out at time of first 100-hour check. Opening 11 is provided with a rectangular Pyralin cover by the manufacturer.

b. FUSELAGE.—Opening 12 (stabilizer screw inspection) is covered by the manufacturer. Opening 13 is covered by the manufacturer. Opening 9 (rudder cable and elevator cable installation) is covered with a spring-clip type round inspection cover by the manufacturer. Opening 10 (elevator cable installation) is covered with a rectangular Pyralin cover by the manufacturer. Opening 14 does not require any covering.

c. ENGINE. *(See figure 13.)*—Engine cowl is detachable for inspection of engine and parts. Periodic checks of engine and parts are discussed in section VIII.

d. Remove wing root fairings to inspect wing hinge fittings.

2. GROUND HANDLING.

The airplane is provided with a tail-lifting handle on the right side of the fuselage below the leading edge of the stabilizer. The best procedure for moving the airplane is to have one man lift and push from here. The wing lift struts may be used for push points providing pressure is applied at a point not more than 2 feet from the fuselage.

CAUTION

Do not push or pull airplane by means of the tail brace wires.

3. JACKING ARRANGEMENTS.

a. No provision for jacking is made in the structure of the airplane.

b. For service or replacement of the landing gear, the following procedure may be used:

(1) Lift up on the lift struts as near as possible to the spar fittings.

(2) Pull down on the lift struts at the same point on the opposite wing.

c. For service or replacement of the tail wheel, the following procedure may be used.

(1) Lift tail up by means of the lifting handle.

(2) Place padded "horse" under lower longerons as far aft as is practicable.

4. LEVELING.

a. The airplane needs to be leveled only when it is being rigged or weighed.

b. To level the airplane, use the following procedure:

(1) See figure 6.

(2) Place adjustable jacks under the front axles.

CAUTION

Be sure that the brake fluid line does not rest on the jacks.

(3) Place adjustable tripod under tail spring immediately aft of fuselage attachment fitting.

(4) Place level across top longerons at the enclosure door rear latch fittings. Right longeron is constructed ⅛-inch lower than left. Compensate for this difference by inserting a block ⅛-inch thick under level at the right longeron.

(5) Adjust jacks under wheels to bring airplane into lateral level.

(6) Place level on left longeron at sliding window behind throttle levers.

(7) Adjust tripod under tail spring to bring airplane into longitudinal level.

5. TIE-DOWN, PARKING, AND MOORING INSTRUCTIONS.

a. To tie down the airplane use the tie-down kit, type D-1.

b. Use the following procedure:

(1) Place airplane with tail into wind.

(2) Drive ground-breaking pin (short, arrow-pointed pin) into ground below tail-wheel spring at a rearward angle. (See figure 14.) Remove pin.

(3) Place mooring arrow on end of long driving rod and drive it in the hole made with the ground-breaking pin for a distance of about 18 inches.

(4) Remove driving rod.

(5) Insert blunt end of threaded anchor rod into anchor arrow and turn it until it is tight.

(6) Attach eye fitting to squared end above ground.

(7) Tie rope to eye and tail wheel. (See figure 14.)

(8) Break ground with ground-breaking pin (paragraph [2], preceding) below each front lift strut spar fitting. Drive pin at a forward angle.

(9) Follow procedure in paragraphs (3) to (6), inclusive.

(10) Tie rope to end eye and to each front lift strut above pulley fitting.

CAUTION

Sufficient slack should be provided in the ropes between the mooring anchors and the aircraft fittings to prevent them from causing failures in the aircraft structure, because of tightening of the ropes by absorbtion of moisture.

(11) Wrap front seat belt completely around rear stick, tighten, and buckle in conventional manner. This will lock the ailerons and elevators and prevent wind damage to these surfaces. (See figure 16.)

(12) See that all switches, valves, and throttles are in "OFF" position.

(13) Close the enclosure door by reaching through sliding window opening.

(14) Adjust sliding window stop screw so that it puts slight tension on sliding window. Slide window up, leaving narrow opening at top to make reopening easier.

(15) Put canvas cover on propeller.

(16) Tie canvas covers over windshield and cellulose acetate canopy.

CAUTION

Do not wrap or tie any ropes to the gas gage wire. When removing covers, be sure the gas wire is not bent.

6. SERVICE (FUEL, OIL).

a. FUEL.

(1) Fuel tank capacity is 12 U. S. (10 Imperial) gallons.

(2) Fuel should be Specification No. AN-F-23, grade 73, or U. S. Army Specification No. 2-103, grade 80.

(3) Remove fuel cap and gage assembly (figure 13); insert hose and fill tank.

(4) Fuel consumption at cruising speed is 4.25 U. S. (3.54 Imperial) gallons per hour.

b. OIL.

(1) Oil reservoir capacity is 1 U. S. (.833 Imperial) gallon.

(2) Use oil, U. S. Army Specification No. 2-104-B, grade 30. As an alternate oil, use Specification AN-VV-O-446, grade 1080 for summer operation and grade 1065 for winter operation.

(3) Drain and refill oil sump every 25 operating hours. Engines equipped with Fram oil filters will be drained and refilled at 100 hours unless the condition of the oil indicates an earlier change is desirable. NOTE: Specification AN-VV-O-446 and U. S. Army Specification 2-104-B oils will not be mixed. If change in oil specification is made, the oil system will be drained before refilling. Used oil of these specifications will not be mixed for reclamation purposes. When a change to U. S. Army Specification 2-104-B oil is to be made initially in an engine previously serviced with Specification AN-VV-O-446 oil, the following procedure will be observed:

(a) The engine sump will be drained and filled with oil, U. S. Army Specification No. 2-104-B, grade 30.

(b) After 10 hours of operation, the sump will be drained and refilled with new oil.

(c) After 15 additional hours of operation, the sump will again be drained and filled with new oil.

(d) Oil changes thereafter will be accomplished as specified in paragraph 6.*b.*(3) of this section.

(4) Replenish oil as needed. Consumption of oil is .25 U. S. pint or .026 Imperial gallon per operating hour.

(5) Oil reservoir filler cap with attached gage rod is located on the right side of the engine. (See figure 13.) Filler cap is accessible by removing cowl pins on right side and partially lifting top section.

CAUTION

Care should be taken when lifting cowl to prevent damage from too much bending.

7. HYDRAULIC BRAKE FLUID.

a. It is very important that the hydraulic brakes be kept in the best operating condition. All connections should be checked for leaks before each day's flight. Slight pressure on each rear pedal will show that the brake works properly. Under normal conditions the level of the fluid in the reservoir should be checked at each 25-hour inspection.

b. On models L-4A and L-4B, if a line breaks and the fluid is lost, repairs and replacement of fluid are made as follows:

(1) Repair or replace line; check line and all connections for leaks.

(2) Remove slotted plug from cylinder. (See figure 19.)

NOTE

Cylinder is located under, and is part of, the rear pedal. Slotted plug is in front of the pedal.

(3) Fill cylinder with Houdaille-type L-475 or AAF Specification No. 3586, grade A, brake fluid.

NOTE

Houdaille-type L-475 brake fluid does not injure fabric or doped surfaces. If other types of fluids are used, care should be taken not to spill such fluids on fabric and doped surfaces.

(4) Slowly pump pedal four or five full strokes.

(5) Open connection "A" at brake pressure plate fitting. (See figure 19.) Place a clean container under opening to prevent waste of fluid.

(6) Pump pedal ahead and hold it. The flow of fluid forces air out of the line.

(7) Close fitting either by tight pressure with thumb or by tightening the connection.

(8) Let pedal return.

(9) Open connection again.

(10) Pump pedal ahead and hold it.

(11) Tighten connection and allow pedal to return.

(12) Fill cylinder completely.

(13) Replace slotted plug.

(14) Check pedal action. Action will be loose and sloppy if there is air in the line. Action will be firm and tight after approximately 1 inch of pedal travel when fluid completely fills the line.

(15) Use the above procedure, paragraphs (2) to (14), inclusive, for bleeding brakes.

c. On model L-4H, if a line breaks and the fluid is lost, repairs and replacement of fluid are made as follows:

(1) Repair or replace line; check line and all connections for leaks.

(2) Remove screw from bleeder tee (a-57-33) at wheel and loosen check nut.

(3) Connect hose from pressure can or pump containing Univis No. 34 brake fluid, AN Specification No. AN-VV-O-366.

NOTE

Use 8½ pounds pressure in can. If pressure can is not available, an ordinary tire pump filled with brake fluid can be used to force the fluid into the system.

(4) Remove hex-head plug from top of cylinder. (See figure 20.)

(5) Place waste or cloths around cylinder to prevent overflow from causing damage to floor boards, fabric, or doped surfaces.

(6) Force fluid out of cylinder until all bubbles disappear by opening the valve on the pressure can or depressing the pump plunger.

NOTE

Fluid will flow for a short interval before the bubbles appear.

(7) Replace plug in cylinder while pressure is still on.

NOTE

Seal plug with Gas-tite or Permatex, U. S. Army Specification No. 2-86, to prevent leaks.

(8) Tighten check nut on bleeder tee; release pressure on the hose by closing valve on pressure can or by raising pump plunger; remove hose.

(9) Insert screw in bleeder tee and draw tight.

(10) Pedal should travel about 1½ inches after this operation.

(11) Use the above procedure, paragraphs (2) to (10), inclusive, for bleeding brakes.

8. LUBRICATING REQUIREMENTS.

(See figure 21.)

Points requiring oil and grease are indicated on the figure.

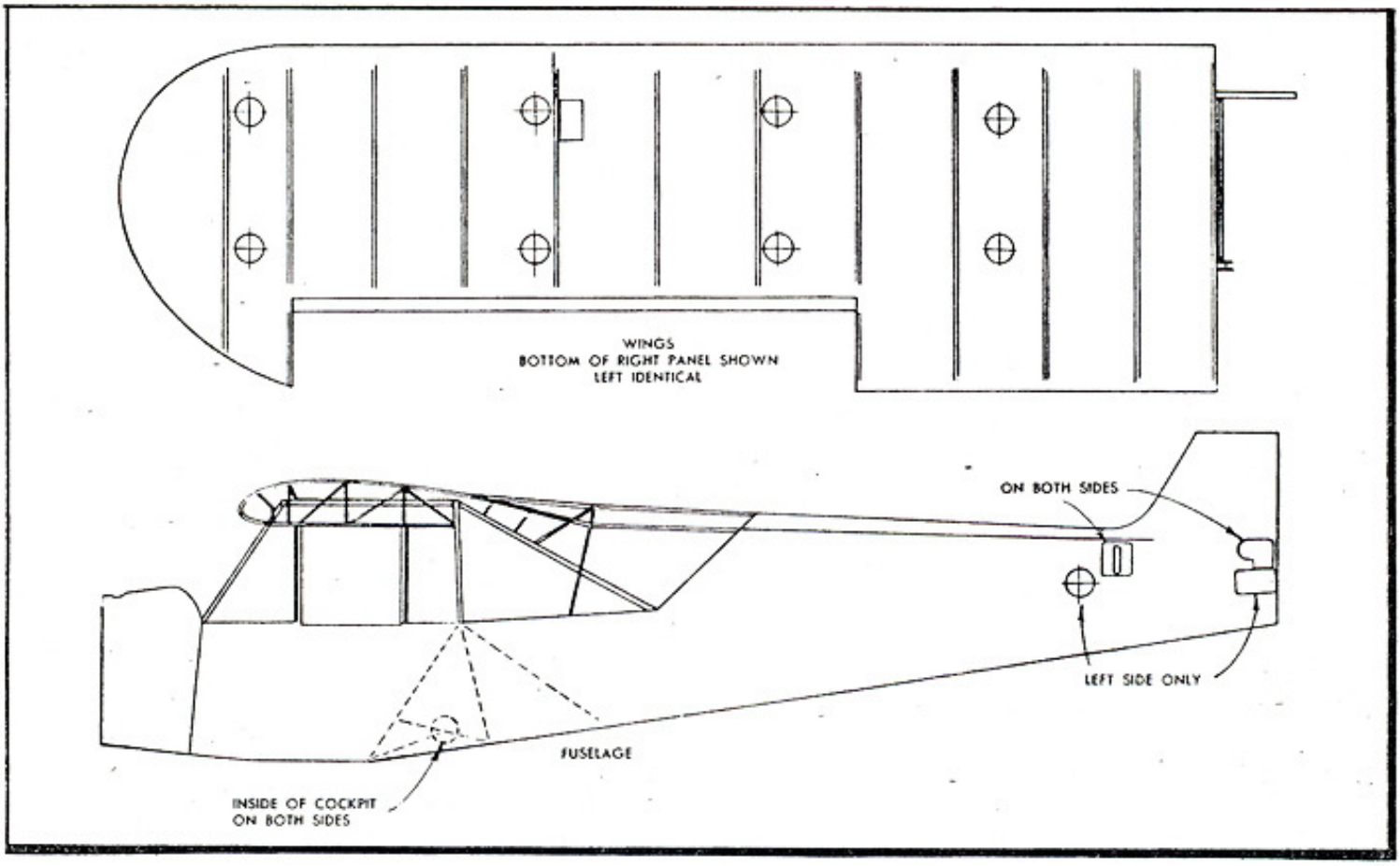


Figure 15—Inspection Holes

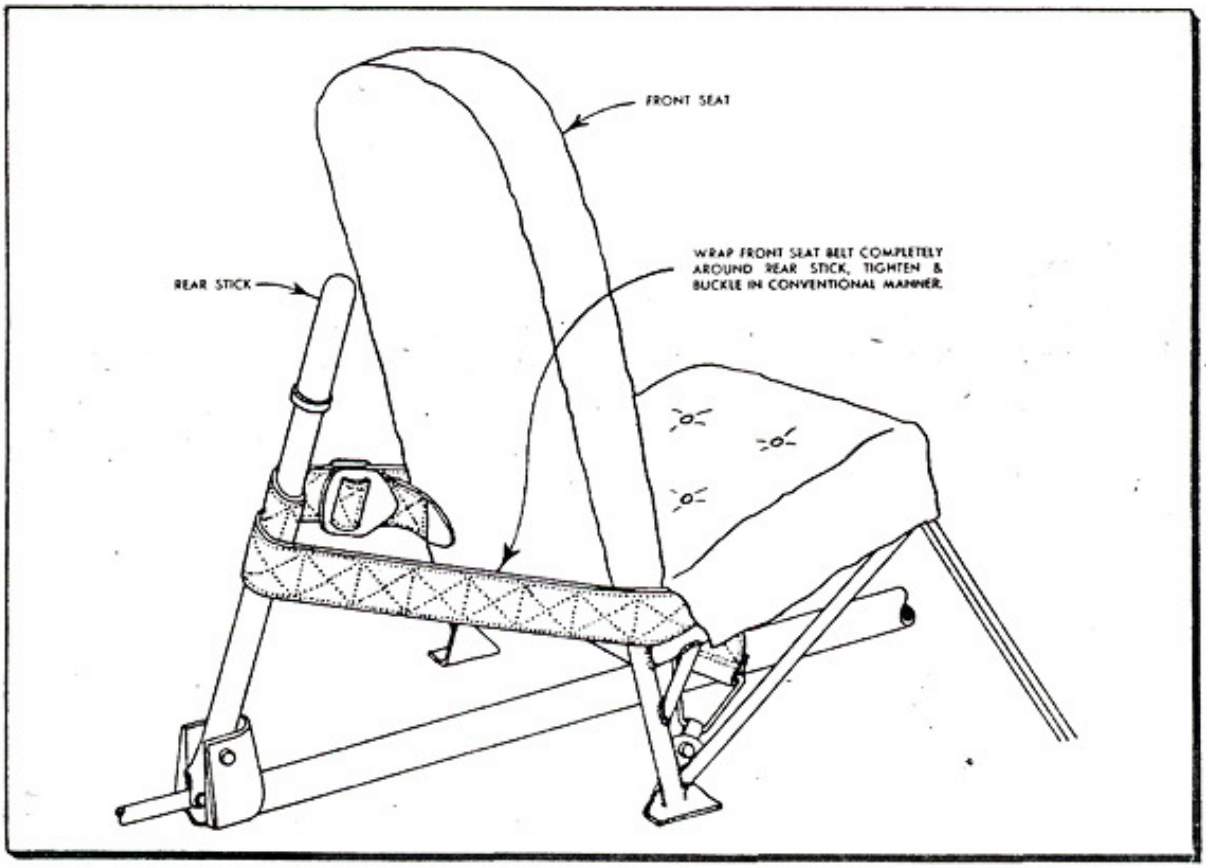


Figure 16—Aileron and Elevator Lock

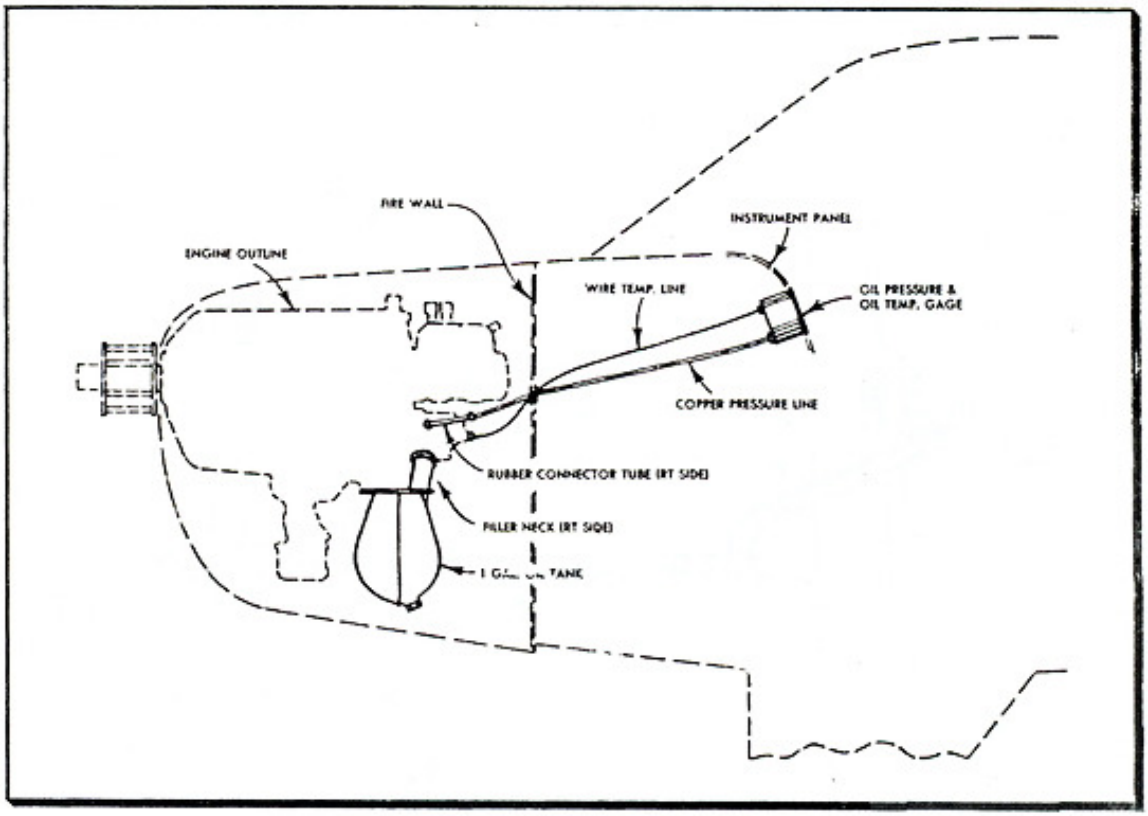


Figure 17—Oil System

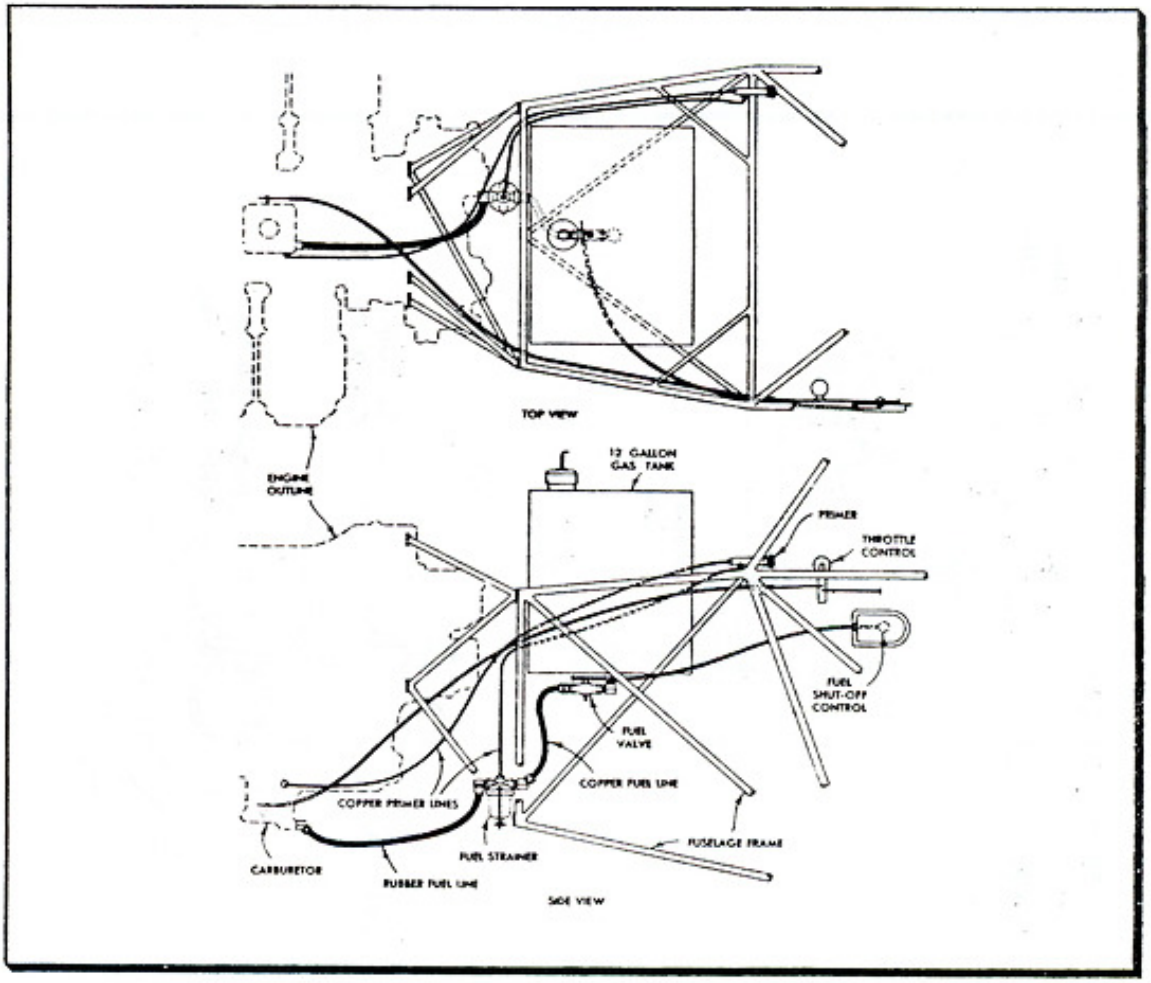


Figure 18—Fuel System Diagram

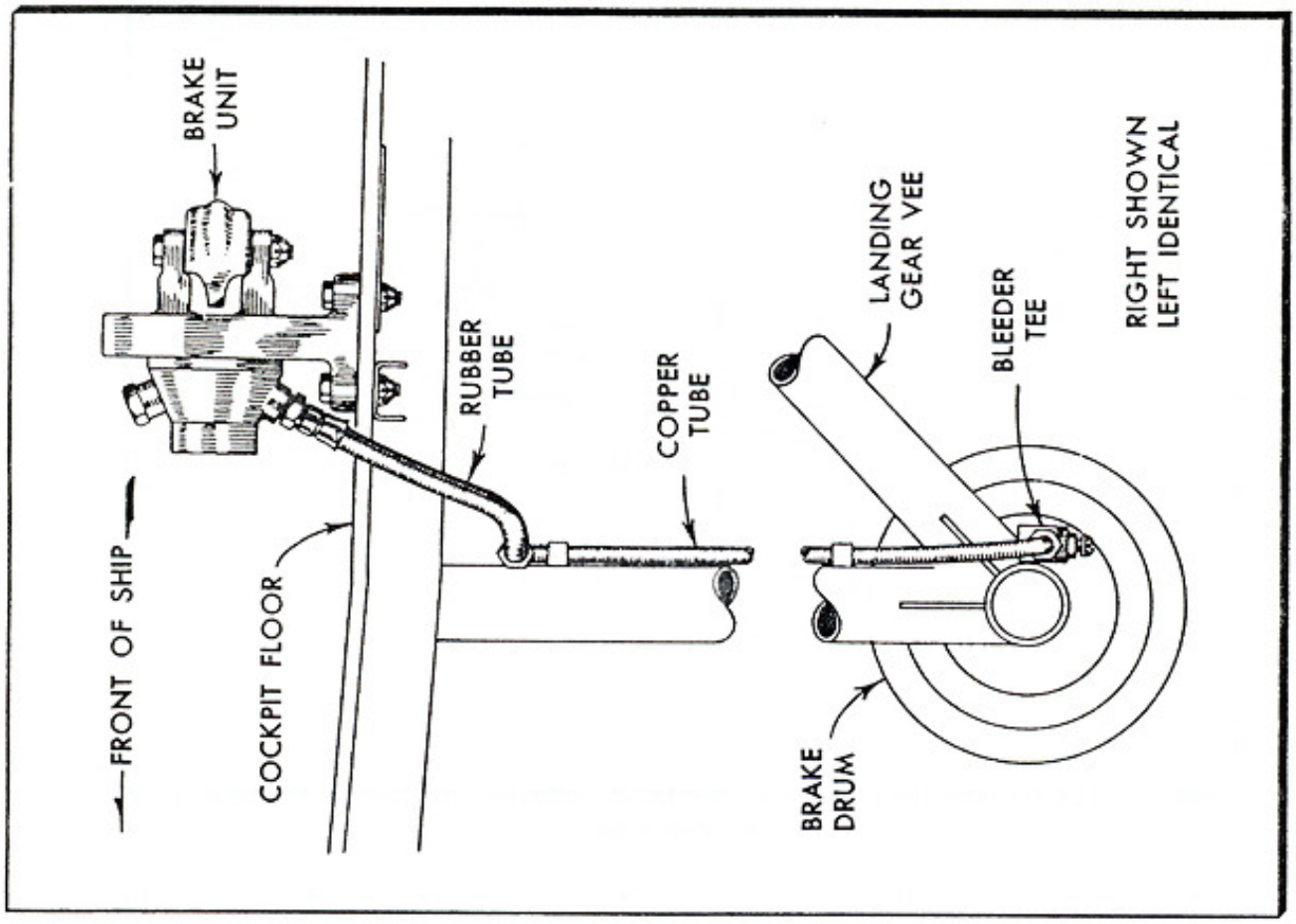


Figure 20—Hydraulic System (L-4H)

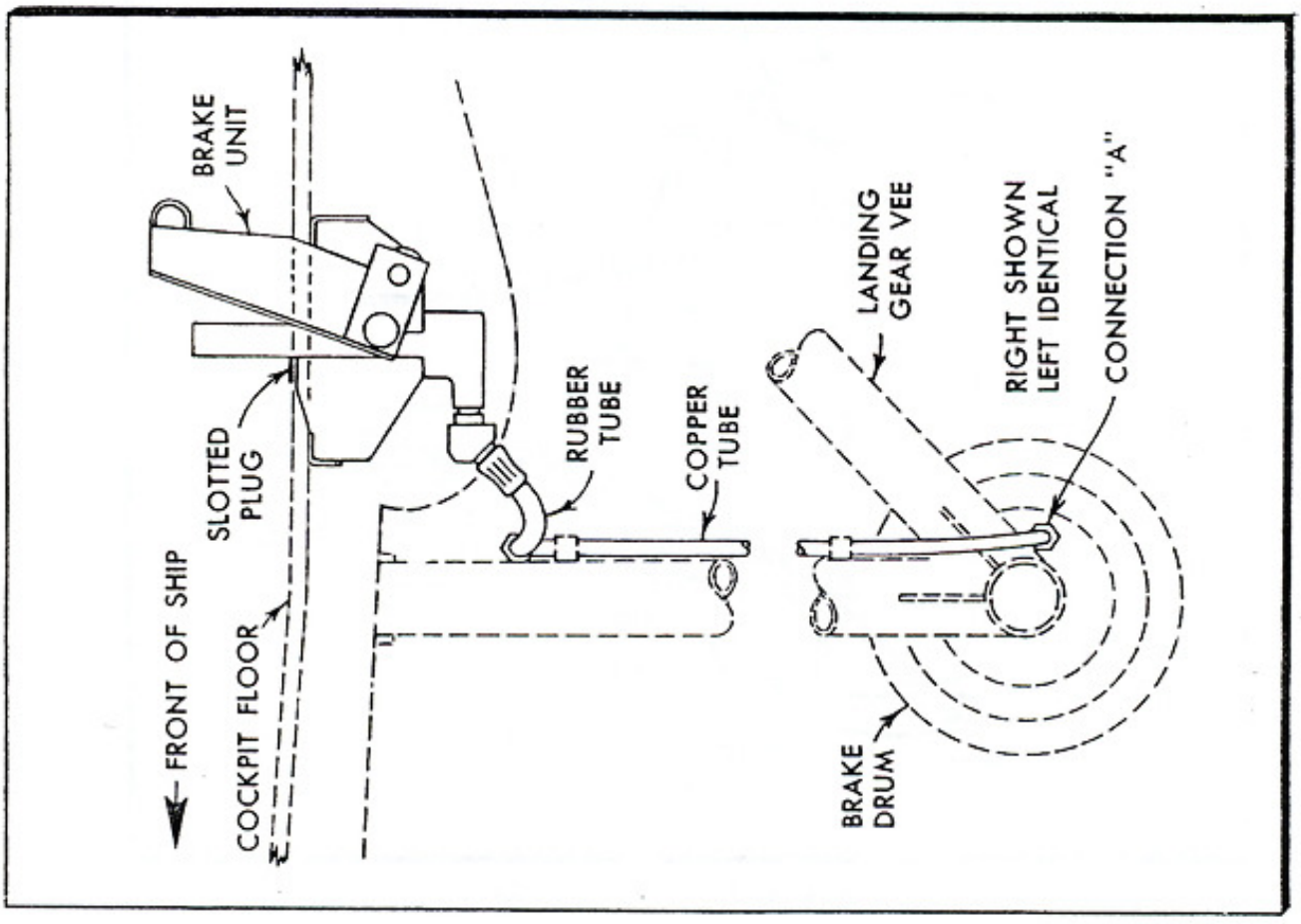


Figure 19—Hydraulic System (L-4A, L-4B)

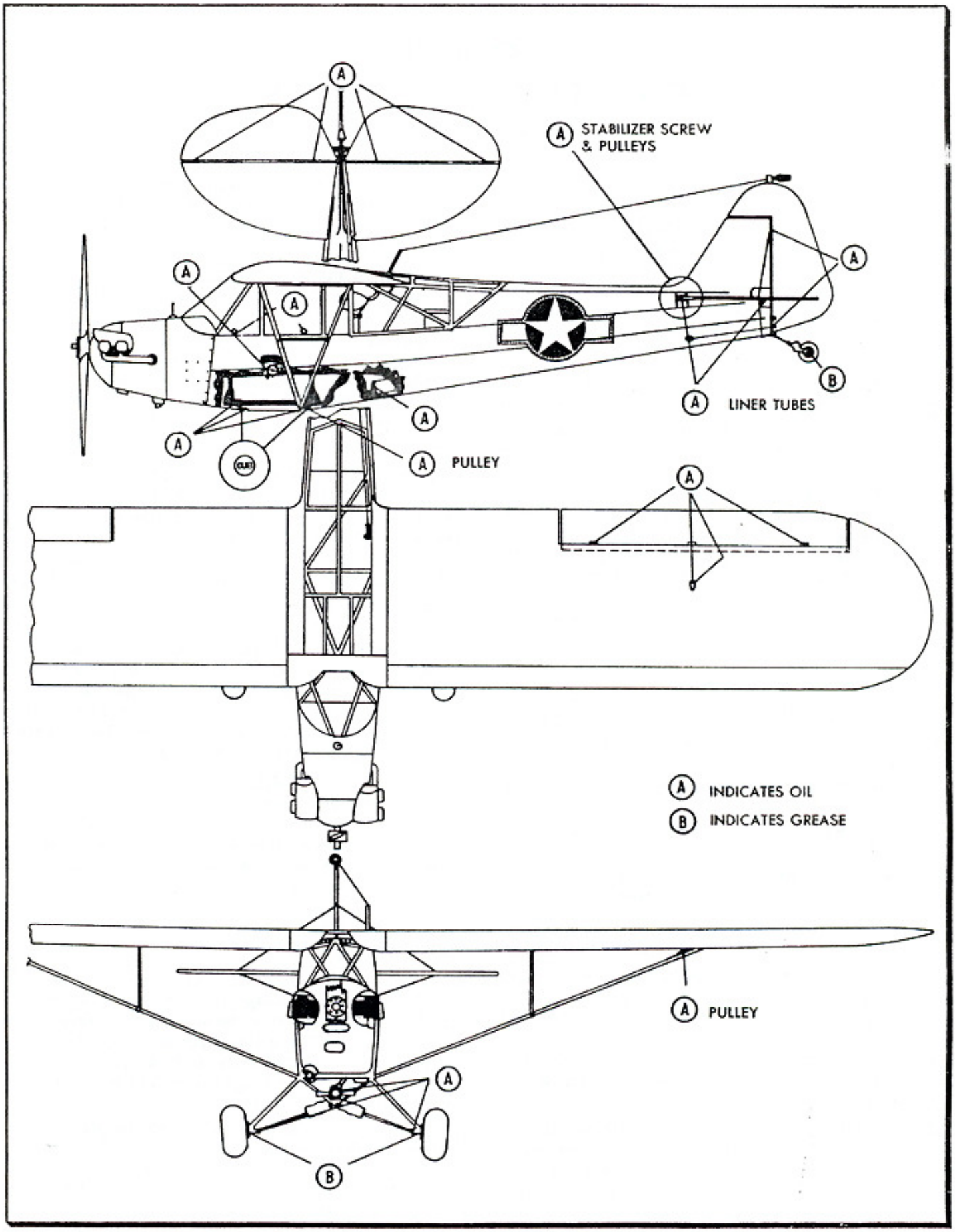


Figure 21—Lubrication Chart

and metal primer, AN Specification No. AN-TT-P-656, should be applied. After the primer has dried, a finish coat of the desired color may be added.

2. FUSELAGE.

a. FUSELAGE FRAME.

(1) The fuselage frame is constructed of seamless steel tubing welded at the joints to form a rigid structure. A number of highly stressed members are of chrome-molybdenum steel. All other members are of SAE 1025 steel.

(2) Accumulations of dirt in the cockpit and in the crevices between the fuselage tubes and the cloth covering should be removed occasionally, as moisture will be absorbed by the dirt with the possibility of corrosion or fabric rot. A regular inspection of the lower longerons near the tail post should be made to guard against corrosion.

b. ENGINE MOUNT.

(1) The engine mount is similar to the fuselage in construction. An occasional check of the bolts attaching the mount to the fuselage should be made to see that these bolts and also the engine attaching bolts are snug. Do not draw these bolts too tight as a failure in one of the bolts may result. It should be remembered that terrific loads can be put on a bolt by overtightening. (See figure 5 for drawing tension.)

(2) In handling the plane on the ground, care should be taken to prevent the application of loads at points other than fuselage clusters as bowed or kinked members may result. Wood fairing strips are used to give the fuselage its form, and these may be damaged by rough handling.

3. CHASSIS.

a. GENERAL.—The main gear on the airplane consists of individually sprung wheels on which are mounted low-pressure tires.

b. TIRES.

(1) It is important that the 8.00 x 4 tires be kept fully inflated to 16 pounds per square inch pressure at all times as operation of the hydraulic brakes when the tires are soft may cause the tires to creep with consequent damage to the valve stem.

(2) It is advisable when installing a tire on a wheel to check to make certain that the beads on the tire are seated on the wheel rim. The tire should then be inflated to about 35-pound pressure to force the tire beads out into the taper of the rim. Air should then be let out until the correct pressure of 16 pounds per square inch is reached. This will assist materially in preventing tire "creep."

(3) At first signs of wear on the tire, reversing the tire on each wheel will equalize wear and give longer tire life.

c. WHEELS.—Cast-aluminum wheels with Timken tapered roller bearings are lubricated at the factory and should not require additional lubrication for several hundred hours. When removing wheels, dust and dirt should be kept out of the bearings. When reinstalling wheels or to remove end play in wheel on axle, do not tighten axle nut enough to cause binding on the roller bearings as this will result in excessive wear. The proper procedure in adjusting the axle nut is to tighten nut while rotating wheel until a slight drag is felt, then back nut off one castellation, and cotter.

d. WHEEL BRAKES. *(See figures 19 and 20.)*

(1) A full hydraulic system of individual wheel braking is used. Heel-type brake pedals are mounted on each side of the cockpit. The rear set of pedals are part of the master cylinder. The front pedals are connected to the rear pedals by means of wire tie rods. Each pedal is thus connected to a master cylinder for individual control of the wheels for ground maneuvering.

(2) It is important that the cylinders be kept filled with genuine Houdaille or Univis No. 34 fluid, AAF Specification No. 3586, grade A, or AN Specification No. AN-VV-O-366, as any air bubbles introduced into the line due to a low fluid supply will cause a loss of brake effectiveness. This fact should be kept in mind when any work is done on the brake system. An indication of air in the brake lines is found in a "fading" pedal, that is, pressure applied to the pedal will cause the pedal to travel to its limit without the usual solid feeling. To remove the air or to service the system see section III, paragraph 7.

(3) It may be well to remember that air may be introduced into the lines if any fitting is disconnected. Care should be taken to prevent brake fluid from getting on brake linings during bleeding operations. Under no conditions should brake pedals be operated when wheels are removed as the brake linings may be sprung out of their housings causing damage to the linings or springs. The operating principle of these brakes depends upon the expansion of a rubber bag under the segments of brake lining. Lubricating oil will damage the system and for this reason only genuine Houdaille should be used on the models L-4A and L-4B, and Univis No. 34, AAF Specification No. 3586, grade A, or AN Specification No. AN-VV-O-366, should be used on the model L-4H.

(4) A routine inspection of the brake system is advisable.

e. LANDING-GEAR FITTINGS.—All hinge fittings should be lubricated regularly with engine oil, and a check for wear or looseness should be made. As the hinge fittings are bushed with steel inserts, these may be replaced to remove play. Bolts should also be inspected for wear and replacement should be made at the first signs of wear. End play should be eliminated by the insertion of washers of correct thickness.

f. TAIL WHEEL.—Tire size is 6 x 2.00, solid rubber. Lubricate all bearings frequently with AAF Specification No. 3560, medium grade. See that all tail-wheel installation bolts are drawn tight. (See figure 4.)

4. CONTROL SURFACES.

a. AILERON.

(1) The aileron structure is of aluminum alloy with fabric covering. A channel runs the length of the aileron and serves as a main spar to which is attached the nose former ribs, nose cover sheet, trailing edge, ribs, hinges, and horn fittings. Soft aluminum rivets are used to attach the component parts to the spar. When it becomes necessary to recover the aileron, it is advisable to check all riveted joints for looseness. The security of the hinges and control attachment should be determined. Lubricate hinges occasionally with light engine oil and check for cotter pins in hinges. Check pins for wear; replace worn parts.

(2) The lateral motion of the control stick rotates the torque tube, to the rear end of which is attached an aileron control arm. Control cables are attached to this control arm and pass over composition pulleys at the edge of the floor, up to the rear edge of the front lift strut to the wings. Where the cables enter the wings, as well as at turns within the wings, they pass over composition pulleys. Passing through the wing to the rear they are connected to the upper aileron horns. A cable connecting the lower aileron horn in each wing passes along the rear of the front spar. Lubricate all moving parts in the aileron system regularly with light engine oil to reduce friction. Inspect all cables for wear at pulleys and fair-leads.

(3) If it becomes necessary to rig the ailerons, use the following procedure:

(a) Locate control sticks at midpoint of lateral travel.

(b) Line up trailing edge of aileron with the inboard trailing edge of wing.

(c) If the aileron is too high, open the turnbuckle on the cable attached to the upper aileron horn and then draw up turnbuckle on cable attached to lower aileron horn the same amount. If the aileron is too low, the above turnbuckle adjustments are in reverse. It may be necessary to check through the rigging several times in order to get the proper positioning of all parts.

(d) Check to see that there is no play or looseness in the action of the ailerons when the control stick is moved.

(e) Safety all turnbuckles and nuts.

NOTE

Do not draw the turnbuckle forks tightly against the horns; the turnbuckles should move freely in all positions over the horns.

b. VERTICAL FIN.—The vertical fin has a steel tube leading edge and rear post. The ribs are of low carbon steel channel. A short stub of steel tube is welded to the lower end of the leading edge spar and fits into a tubular socket in the fuselage. An AN bolt fastens these parts together. During periodic inspections these bolts should be checked for tightness and cotter pins.

c. RUDDER.

(1) The rudder has a steel tube leading and trailing edge and channel steel ribs. No maintenance other than an inspection for corrosion during overhaul is necessary. Drain grommets in the rudder cover should be kept open. The hinges attaching the rudder to the tail post and fin rear spar should be lubricated with light engine oil. Accumulations of dust and dirt on hinges should be removed.

(2) The rudder control system is fairly simple and very little maintenance is necessary. Inspect control cables at the fair-lead under the seat, and those just ahead of the point near the tail where the cables pass through the fuselage cover. See that rudder pedal return springs are operating to hold the pedals back. Lubricate hinges with light engine oil.

d. STABILIZER.

(1) The stabilizer has a steel frame consisting of tubular leading and trailing edges and channel steel ribs. The leading edge has a tubular steel liner inside the front spar, joining the two sections of the stabilizer. A stabilizer yoke is attached thereto, through which an adjusting screw passes. A pulley on the lower end of the screw is turned by means of an endless cable from a crank on the left side of the cockpit. Lubricate screw mechanism with light engine oil. Do not allow any of the lubricant to get on the cable as it causes the cable to slip.

(2) A tubular steel liner joins the two sides of the stabilizer at the trailing edge, and this liner passes through a short tube installed in the fuselage. An occasional check should be made to see that the bolts attaching the leading and trailing edges to the liners are drawn snug, and that cotter pins are in place.

(3) Steel tie rods brace the stabilizer to the fin and fuselage. These tie rods should not be rigged tighter than necessary as high loads may be imposed on other parts of the tail surfaces or fuselage. It should be remembered that even with the tie rods rigged "flabby," they will be tensed by a very slight deflection of the surfaces and thus will do their work as well as if they were rigged very tightly. In adjusting the tension of the tie rods, care should be taken so that marring of the rods will not result. Friction tape should be wrapped around the rods near the threads. Pliers nay then be used to grip the wires but be certain to grip on the tape. The nipple may then be turned with a wrench after the lock nuts have been loosened. Two threads at each end of the rod must be visible through the end of the nipple. A line inspection of the tie rod and fittings should be made to check cotter pins and lock nuts.

(4) The stabilizer is operated by a crank located on the left side of the cockpit. An endless stranded cable passes around a V-groove pulley attached to the crank, then back through the fuselage to another V-groove pulley on the lower end of the stabilizer adjusting screw. Turning crank forward or backward rotates the screw which in turn raises or lowers a stabi-

lizer yoke attached to the front of the stabilizer. This alters the angle of incidence which compensates for "nose heaviness" or "nose lightness."

CAUTION

Under no circumstances should the stranded cable from the cockpit to the rear of the fuselage be lubricated as this may cause slippage. If it becomes necessary to increase the tension on this cable, an idler pulley adjusting nut is located at the tail near the front of the stabilizer and is accessible by removal of the inspection plate on the left side of the fuselage. Do not tighten this nut excessively as binding of the driving mechanism may result.

(5) The stabilizer indicator consists of a fine wire passing back from the control crank in the cockpit, over a composition pulley in the tail of the fuselage, to the stabilizer yoke. If any adjustments are made to the stabilizer indicator system, check to assure correct functioning of the stabilizer indicator with respect to stabilizer position.

(6) A return spring of the stabilizer indicator mechanism is located above the stabilizer operating crank and is accessible by removal of the indicator faceplate.

e. ELEVATORS.

(1) The elevator structure is very similar to the rudder. No maintenance other than inspection for corrosion is needed. The hinges attaching the elevators to the stabilizer should be cleaned and lubricated with light engine oil at frequent intervals.

(2) The fore-and-aft motion of the control sticks is transmitted back through the fuselage by means of the following linkage. The sticks are mounted on a torque tube which passes beneath the front seat above the floorboard. The lower ends of the sticks are connected to a push-pull tube which passes through the torque tube and imparts action to a bell crank located behind the rear seat. Two ⅛ inch 7 x 19 cables are attached to this bell crank and are connected at the rear to the elevator horns by means of turnbuckles and links.

NOTE

See that turnbuckles move freely in all positions over the links.

(3) The principal control system parts are readily serviced and inspected by removing the inspection plates on the belly of the ship.

(4) An occasional lubrication of the elevator bell crank located behind the rear seat will reduce control system friction and prolong bearing life.

5. FUEL SYSTEM.

(See figure 18.)

a. FUEL TANK.—The fuel tank is located in the fuselage between the engine fire wall and instrument panel, and has a capacity of 12 U. S. (10 Imperial) gallons. This fuel tank is supported by flat steel straps lined with felt to prevent chafing. If it becomes necessary to remove the fuel tank, drain fuel and disconnect fuel line and shut-off valve control shaft. Remove filler cap and all lines and controls which run under the tank to the instrument panel. Then remove the diagonal fuselage tube running from the upper right longeron to the center of the fuselage cross tube at the floor behind the fire wall. This is easily done by removing the bolt in each end of the fitting and then sliding tube downward outside the lower fitting. The tank may then be removed from the cockpit without removing the cowling.

b. PRIMER.—A primer to assist in starting the engine is mounted on the instrument panel. A fuel line runs from the strainer up to the primer pump, and a return line runs back to the engine. Always see that the primer plunger seats firmly, as irregular operation of the engine may result from leaking needle valve in the primer pump.

c. CARBURETOR HEATER.

(1) A carburetor heater is installed on the engine and is operated by a push-pull control on the right side of the cockpit by means of which the pilot can regulate temperature of the air entering the carburetor. Little maintenance is necessary; however, check valve for free operation.

(2) Extreme care should be taken in hot weather to see that no carburetor heat is used; otherwise, overheating of the engine may result.

(3) The points of the fuel system which require regular servicing are:

(a) Fuel strainer on fire wall.

(b) Drain in fuel tank.

(c) Strainer in fuel tank.

d. FUEL STRAINER.—The fuel strainer is located in the engine compartment on the fire wall and should be inspected daily for accumulations of water or sediment. It is a good habit to remove bowl and screen from the fuel strainer at least every 10 hours and clean both and flush the lines by allowing fuel to flow through with bowl removed. Always safety nut under bowl after servicing.

e. TANK DRAIN.—A drain is located at the rear of the gasoline tank and is accessible from the cockpit. Remove the drain plug to allow water and sediment to drain from the tank.

f. TANK STRAINER.—A finger strainer is located in the fuel tank outlet fitting to which the fuel line attaches. This finger strainer is intended to prevent large particles of foreign matter entering the fuel lines. The finger strainer should be removed and cleaned every 100 hours by removing the fuel line and fittings from the bottom of the tank.

6. ELECTRICAL SYSTEM.

a. A 6-volt electrical system is installed as standard equipment in the L-4A only. Equipment includes a

SECTION V
FINISH SPECIFICATIONS

1. APPLICABLE SPECIFICATIONS AND INSTRUCTIONS.

This aircraft is finished in accordance with Civil Aeronautics Administration requirements and best commercial practices.

2. GENERAL INSTRUCTIONS.

This specification covers the protective treatment of each section of the airplane.

3. MATERIAL.

All materials used in the finishing of any one aircraft part shall conform with Civil Aeronautics Administration requirements and shall be subject to such tests as the inspector shall prescribe to determine compliance with these requirements.

4. APPLICATION OF SURFACE TREATMENTS OTHER THAN PAINTING.

a. CLEANING MATERIALS.

(1) ALUMINUM, AND TERNEPLATE SURFACES.

(a) Wash thinner, type B-1. Use thinner, dope, and lacquer, AN Specification No. AN-TT-T-256.

(b) Thinner shall be applied with brush or soft cloth to remove oily film.

(c) Wipe surface dry with soft, clean cloths.

(2) OUTSIDE SURFACES OF STEEL TUBING AND ALL SURFACES OF STEEL FLAT STOCK.

(a) Dilute solution of metal prep, phosphoric acid-alcohol cleaner. (Refer to paragraph 14.*b.*, following.)

(b) After major forming and cutting operations, dilute solution shall be applied to surfaces with a brush.

(c) Surfaces shall be wiped dry with clean, dry cloths.

(d) Inside surface of tubing shall not be cleaned.

(3) NEUTRALIZER AFTER SOLDERING.

(a) Wash solution, 1 pound of sodium bicarbonate in 5 gallons of water.

(b) Bathe surfaces in solution to remove acid condition necessary for soldering.

(4) WELDED SURFACES.

(a) Welded sections shall be thoroughly brushed or sandblasted to remove welding flux or scale.

(b) Metal prep (phosphoric Acid-Alcohol Cleaner) shall be applied to these areas after brushing.

b. CADMIUM PLATING.—Cadmium-plated parts are procured under the following classifications:

	Class	
Aircraft bolts and nuts	04-A	AAF stock
Lock washers	29	AAF stock
Plain washers	04-A	AAF stock
Cotter pins	29	AAF stock
Turnbuckles	04-A	AAF stock
Strut fork ends	04-A	AAF stock

c. ZINC PLATING.—All surfaces to be zinc plated (galvanized) shall be processed in accordance with Civil Aeronautics Administration requirements. All parts that are zinc plated are purchased from Air Associates, Inc., Garden City, N. Y. Items are 7 x 19 and 7 x 7 flexible control cables (AN Specification No. AN-RR-C-43, class 04-A).

d. CHROMIUM PLATING.—All parts or surfaces to be chromium plated shall be processed in accordance with standard commercial practice. All chromium-plated parts are stabilizer adjustment crank and escutcheon plate; both items buffed to a satin finish and purchased from the Dura Products Co., Toledo, Ohio.

5. APPLICATION OF FINISHING MATERIALS.

a. CONDITION OF SURFACES.—All surfaces shall be thoroughly clean and dry at time of application of any paint coating.

(1) CLEANING OF SURFACES. (See paragraph 4, *a.*, preceding.)

b. AIR AND WEATHER CONDITIONS.—The following atmospheric conditions shall be met:

(1) Dopes and primers shall be applied at temperatures between 21 to 32° C (70 to 90° F).

(2) Relative humidity shall be held below 60 percent.

(3) Air shall be clean and fresh. Dope or primer shall not be applied where strong drafts or moist sea breezes prevail.

(4) Blush shall be avoided. Blushing is caused by too rapid evaporation or relative humidity conditions are too high. Blushing tendencies are increased if strong currents of air flow over the surfaces when spraying or immediately thereafter. Add 10 to 25 percent of thinner blush retarder AN Specification No. AN-TT-T-250 to thinner AN Specification No. AN-TT-T-256, if blushing persists.

c. PREPARATION OF COATING MATERIALS.—Materials shall be prepared for application under clean conditions with clean equipment. Mixing shall be controlled by either weight or volume to insure uniformity of all materials prepared for use. Figure 22 forms the basis of procedure for mixing dopes and primers.

d. FILM THICKNESS.—Contractors, painters, and inspectors should endeavor to control film thickness within established limits. The normal thickness of a single coat of finish used on metal is considered to be .001 plus or minus 20 percent for enamel and lacquer and half this for primer. The film thickness of material on fabric is applied as follows:

(1) DeVilbiss MBC gun, FF fluid tip, 704 aircap, or equal.

(2) Pressure: fluid 40 pounds in ⅜-inch hose. Air 60 pounds.

(3) Temperature: 24 to 27° C (75 to 80° F).

(4) Hold gun 5 to 7 inches from surface.

(5) Travel: approximately 2 feet per second.

e. Zinc-chromate primer spray-coated shall be applied as follows: (See figure 23.)

(1) DeVilbiss gun with cup, AV-15E fluid tip and needle, 306 aircap, or equal.

(2) Pressure: air 50 pounds.

(3) Hold gun 6 to 8 inches from surface.

(4) Travel: approximately 2 feet per second.

f. DRYING TIME AS INFLUENCED BY FILM THICKNESS.—It is estimated that drying time will increase at a rate proportional to a value between the square and the cube of the film thickness. Thus, the total drying time of a series of thin films will be lower than that of one thick coat. It is important that true drying be distinguished from apparent drying. (Paragraphs 9. *a.* (10) and (11), following.)

g. APPLICATION BY DIPPING.—Zinc-chromate primer is applied to tubing surfaces and the various small parts by dipping. The flow method, alternate to dipping, is used when large surfaces such as fuselage and tail surfaces are to be primed as a unit.

6. DETAIL REQUIREMENTS FOR FINISHING SYSTEMS.

Zinc-chromate primer, AN Specification No. AN-TT-P-656 shall be applied as noted in figure 23.

7. SPECIAL REQUIREMENTS FOR CORROSION PREVENTION.

FREE DRAINAGE.—Drain holes are provided on the undersurface of the wing and ailerons at the trailing edges. Holes are also provided on the undersurface of the elevators and stabilizers. Holes allow free drainage of moisture from these areas. Holes are reinforced with Pyralin grommets to prevent tears in the fabric.

8. GENERAL PRECAUTIONS.

a. WELDING AND SOLDERING.—After soldering the lock seams and joints on the gas tank, the surfaces are carefully washed in sodium bicarbonate solution to remove all excess soldering acids. Welds are brushed with wire brush or sandblasted.

b. WORKING SURFACES.—Special care shall be exercised to ascertain that paint is not applied to working parts or to adjustable screw threads, oil holes and cables. Paint shall not be applied to fittings in such manner as to cause malfunctioning of bearings, hinges, or pulleys.

c. RUBBER.

CAUTION

Rubber shall not be painted, oiled, or greased.

d. FIRE WALL.—Fire walls and engine structures forward thereof shall receive the minimum finishing material compatible with reasonable protection. Engine mount, after welds and tubing have been thoroughly cleaned, shall be finished with dip primer.

9. FABRIC SURFACES.

a. GENERAL.—Fabric-covered surfaces shall be doped according to the following procedure:

(1) Before applying any coat of dope (whether clear or pigmented) all surfaces shall be free from dust, dirt, or grease and properly dried.

(2) All clear doped surfaces shall not be exposed without a protective covering of dope for a period of over 48 hours.

(3) Complete and thorough adhesion of the various layers depends upon the fact that each wet coat softens and partially dissolves the layer immediately under it. If a top coating, therefore, is applied over a dope which does not soften, no real adhesion occurs. Thus, if pigmented nitrate dope containing absolutely no cellulose acetate solvent is applied over a cellulose acetate dope film, it may not adhere.

(4) Thinning must be properly accomplished and controlled.

(5) The weight of coatings must be controlled, and uniform coatings free from defects must be applied.

(6) Sandpaper must be cautiously applied.

(7) Dope shall never be poured on surface.

(8) Dope shall not stand in open containers exposed to the air for more than 1 hour.

(9) Pigmented dope must be stirred in the containers at frequent intervals to insure correct shade, protection film, and amount of covering and hiding.

(10) Evidence of proper drying of doped surfaces:

(a) Shall be exposed to air at 27° C (80° F), 40 minutes to 1 hour.

(b) Fabric shall show increasing tightness with each additional application.

(c) Sandpapering operation shall produce a dust which does not adhere tenaciously to the sandpaper.

(11) Evidence of proper drying of spray primed zinc-chromate primer:

(a) Treated surfaces shall be exposed to air at 32° C (90° F), 20 minutes to 2 hours.

b. DETAIL FOR WINGS.

(1) Use spray equipment noted in paragraph 5, preceding.

(2) First coat of clear dope (paragraph 5. c. preceding) shall be brushed on.

(3) Brush clear dope on leading edge.

(4) Allow coat to dry.

(5) Nap shall be removed by hand sanding using 180X grit dry sanding paper.

(6) Second coat of clear dope shall be brushed on.

(7) Brush clear dope on leading edge.

(8) Allow coat to dry.

(9) Hand-sand lightly, using 180X grit dry sanding paper.

(10) Tapes, grommets, and reinforcement patches shall be applied using clear dope brushed on as the adhesive vehicle.

(11) Allow tapes, grommets, and patches to dry.

(12) Lightly sand edges of tapes and reinforcement patches, using 170X grit dry sanding paper.

(13) Third coat of clear dope shall be applied vertically.

(14) Brush clear dope on tapes and leading edge.

(15) Spray clear dope on tapes and leading edge.

(16) Allow coat to dry.

(17) Hand-sand entire surface lightly to a smooth finish.

(18) On models L-4A and L-4B, two coats of aluminum dope (paragraph 5. c. preceding) shall be sprayed on, the second cross-coating the first while it is still wet. These coats of aluminum dope may be eliminated.

(19) Allow coats to dry.

(20) Hand-sand entire surface to a smooth finish with 180X grit dry paper.

(21) Two coats of finish color dope (paragraph 5. *c.*, preceding, and 11. *a.* following), sprayed on, the second coat cross-coating the first while still wet.

(22) Allow coats to dry for finished surface.

c. DETAIL FOR FUSELAGE AND OTHER COVERED SURFACES.

(1) Use spray equipment noted in paragraph 5. d., preceding, or equal.

(2) First coat of clear dope (paragraph 5. *c.*, preceding) shall be brushed on.

(3) Allow coat to dry.

(4) Nap shall be removed by hand sanding, using 180X grit dry sanding paper.

(5) Second coat of clear dope shall be brushed on.

(6) Allow coat to dry.

(7) Hand-sand lightly, using 180X grit paper.

(8) Tapes, grommets, and reinforcement patches shall be applied, using clear dope brushed on as the adhesive vehicle.

(9) Allow tapes, etc., to dry.

(10) Hand-sand edges of tapes and reinforcements lightly using 180X grit dry sanding paper.

(11) Third coat of clear dope shall be sprayed horizontally.

(12) All tapes shall be brushed with clear dope and then sprayed.

(13) Allow coat to dry.

(14) Hand-sand lightly with 180X grit dry sanding paper (portable sanding machine with 180X grit belt alternate) to a smooth finish.

(15) Two coats of aluminum dope (paragraph 5. *c.*, preceding) shall be sprayed on, the second coat cross-coating the first while still wet, on models L-4A and L-4B. These coats of aluminum dope may be eliminated.

(16) Allow coats to dry.

(17) Hand-sand entire surface to a smooth finish using 180X grit dry sanding paper.

(18) Two coats of finish color dope (paragraph 5. *c.*, preceding, and 11. *a.*, following) shall be sprayed on, the second coat cross-coating the first while still wet.

The cockpit fabric shall be treated the same as the external fabric. Two coats of olive-drab pigmented dope (paragraph 5. *c.*, preceding) shall be cross-coated on the other surfaces such as floor boards, seats and pedals. All surfaces not to be doped shall be adequately protected with masking tape and heavy wrapping paper.

d. DOPE PROOFING.—The dope proofing of ferrous metal surfaces in contact with doped fabric is not required where zinc-chromate primer or lacquer are the finishing materials. A slight bleeding action of the color of these materials through the fabric on the first application is not objectionable. Oleoresinous base vehicles such as varnish shall not be applied to metal parts which are subsequently covered with doped fabric.

10. MISCELLANEOUS ITEMS AND REQUIREMENTS.

a. ACID PROOFING.—The inside surfaces of the battery box and lid shall be painted with two coats of acidproof paint. (Refer to paragraph 13. *b.*, following.)

b. CONTROL CABLES.—Cables shall be protected by the manufacturer's galvanized coating only. (Refer to paragraph 4. *c.*, preceding.)

c. TANKS.

(1) METAL FUEL TANKS.—Gas tanks shall be protected with spray primer (paragraph 6., preceding). All loose particles of metal or other foreign matter shall be removed from the interior by circulation of compressed air. Washing of interior with bicarbonate of soda to neutralize soldering acids and sloshing the tanks with AAF Specification No. 3595 compound shall constitute the total protective effort. (See paragraph 4. *a.*, preceding.)

(2) OIL TANKS.—The interiors of oil tanks require no paint coating. However, tanks to be placed in storage shall be filled with light oil and drained.

d. FINISH FOR INTERIOR WOOD SURFACES.—Wing spars shall be treated with two coats of clear wood lacquer brushed on the side surfaces and three coats of clear wood lacquer brushed on the edge sur-

faces. Wing tip bow shall receive two coats of clear wood lacquer brushed on entire surface before installation, and one coat brushed on all points after installation.

e. FINISH FOR PLYWOOD SURFACES.—Plywood surfaces shall receive one coat of clear wood lacquer (paragraph 13. *b.*, following), brushed on before installation, and after installation shall be sprayed with two coats of olive-drab pigmented dope (paragraph 5. *c.*, preceding) during the process of treating the cockpit. (Refer to paragraph 9. *c.*, preceding.)

11. COLOR SYSTEM.

a. EXTERIOR.—All exterior surfaces of the airplane will be finished with shade 41, olive-drab pigmented dope, on upper and side surfaces and shade 43, neutral gray pigmented dope, on lower surfaces. (Refer to paragraphs 5. *c.* and 9. *a.*, preceding.)

b. COCKPITS—The cockpits of service airplanes other than flying boats shall be finished as noted in paragraph 10. *a.*, preceding.

12. INSIGNIA AND MARKING.

a. The new standard insignia will be applied to top surface of left wing and lower surface of right wing.

b. The new insignia will be applied to each side of the fuselage near midway between the trailing edge of the wing and leading edge of the horizontal stabilizer.

13. MATERIALS USED FOR PROTECTIVE COATINGS.

a. Materials used on airplanes originally are commercially compounded and meet the requirements of Army Specifications and conform to Civil Aeronautics Administration requirements.

b. The following specifications will be used for protective coatings:

MATERIAL	GAL	GAL THINNER AN-TT-T-256	DEGREES TEMP F	DEGREES TEMP C	VISCOSITY IN SECONDS No 4 FORD CUP	ZINC CHROMATE PRIMER FOR DIP AND FLOW APPLICATION: Two parts zinc chromate primer and three parts Toluene substitute thinner by volume.
Clear Dope	7	1	70	21.1	75	
Olive Drab	2	1	70	21.1	31	
Neutral Gray	2	1	70	21.1	46	
Insignia White	1	1	72	22.2	26	ZINC CHROMATE PRIMER FOR SPRAY APPLICATION: One part zinc chromate primer and two parts Toluene substitute by volume. (See section V, paragraph 13.)
Insignia Blue	6	4	71	21.7	18	
Aluminum Dope*	55	6	70	21.1	68	

*12 lb of Aluminum Paste (Federal Specification No. TT-A-468) in 55 gal. dope (AN Specification No. AN-TT-D-551). Aluminum dope not used on model L-4H.

Figure 22—Mixing Chart

PART	APPLICATION METHOD	DRYING TIME
Fuselage and Superstructure	Flow Method	40 min
Stabilizers	Flow Method	40 min
Rudder	Flow Method	40 min
Elevators	Flow Method	40 min
Enclosure Door	Flow Method	40 min
Landing-gear Vees	Flow Method	40 min
Instrument Panel	Spray Method See Sect. V,5.e.	30 min
Lift Struts	Spray Method	2 hours
Engine Cowl	Spray Method	30 min
Fuselage Cowl	Spray Method	30 min
Fuel Tank	Spray Method	20 min
Metal Fairings	Spray Method	20 min
Engine Baffles	Spray Method	20 min
Strut-Spar Attach. Fittings	Dip Method	30 min

PART	APPLICATION METHOD	DRYING TIME
Torque Tube	Dip Method	30 min
Pedals	Dip Method	30 min
Seat Frames	Dip Method	30 min
Bell Crank	Dip Method	30 min
Aileron Hinge Parts	Dip Method	30 min
Tubes, Compression	Dip Method	30 min
Plates	Dip Method	30 min
Wing Butt Attach. Plates	Dip Method	30 min
Washers	Dip Method	30 min
Engine Mount	Dip Method	30 min
Clamps	Dip Method	30 min

NOTE: MIXTURE WILL BE ACCORDING TO FIGURE 24, MIXING CHART

Figure 23—Primer Chart

Dope, Cellulose nitrate, clear, AN Specification No. AN-TT-D-514 (for tautening precoats)

Dope, Cellulose nitrate, clear, AN Specification No. AN-TT-D-551 (for aluminum dope)

Dope, Cellulose nitrate, shade 41, olive drab, AAF Specification No. 14106

Dope, Cellulose nitrate, shade 43, neutral gray, AAF Specification No. 14106

Dope, Cellulose nitrate, shade 46, insignia white, AAF Specification No. 14106

Dope, Cellulose nitrate, shade 47, insignia blue, AAF Specification No. 14106

Lacquer, Cellulose nitrate, clear, AN Specification No. AN-TT-L-51

Varnish, Asphalt acidproof, Federal Specification No. TT-V-51

Thinner, Cellulose nitrate, dope and lacquer, AN Specification No. AN-TT-T-256

Thinner, Toluene substitute, AN Specification No. AN-T-8

Thinner, Cellulose nitrate, dope and lacquer, blush retarding, AN Specification No. AN-TT-T-258

Primer, Zinc-chromate, AN Specification No. AN-TT-P-656

Varnish, Spar, phenol-formaldehyde, AN Specification No. AN-TT-V-118

14. CLEANING MATERIALS.

Materials used for cleaning purposes follow:

Thinner, Cellulose nitrate, dope and lacquer, AN Specification No. AN-TT-T-256

Phosphoric acid-alcohol cleaner:
Butyl alcohol, 4 gallons
Isopropyl alcohol, 3 gallons
Phosphoric acid, 1 gallon (14 pounds)
Water, 2 gallons

Store in glass or earthenware containers.

Sodium bicarbonate (baking soda)

15. SPECIFICATIONS FOR INGREDIENT MATERIAL.

Paste, Aluminum pigment, Federal Specification No. TT-A-468.

Thinner, Cellulose nitrate, dope and lacquer, blush retarding, AN Specification No. AN-TT-T-258

Zinc-chromate primer, AN Specification No. AN-TT-P-656

Toluene substitute, AN Specification No. AN-T-8

SECTION VII
CABLE CHART

NAME	NUMBER	LENGTH	DIAMETER	MATERIAL	FITTINGS
Rear rudder pedal to rudder	40123-2	15 ft 3 3/16 in.	1/8 in.	7x19 galv	2 AN100-4* 1 AN115-16* 1 AH013589*
Front rudder pedal to rear rudder pedal	40123-7	25 ft 3/16 in.	1/8 in.	7x19 galv	2 AN100-4 2 AN115-16
To aileron lower horn	40123-3	14 ft 0 5/16 in.	1/8 in.	7x19 galv	2 AN100-4 1 AN115-16 1 AH013589
To aileron upper horn	40123-28	14 ft 6 3/16 in.	1/8 in.	7x19 galv	2 AN100-4 1 AN115-16 1 AH013589
To elevator upper horn	40123-5	11 ft 5 1/8 in.	1/8 in.	7x19 galv	2 AN100-4 1 AN115-16 1 AH013589
Stabilizer adjustment control cable	41671	25 ft 8 3/4 in.	1/16 in.	7x7 galv	ENDLESS
To elevator lower horn	40123-6	11 ft 4 1/2 in.	1/8 in.	7x19 galv	2 AN100-4 1 AN115-16 1 AH013589

*AN100-4 Thimble *AN115-16 Shackle *AH013589 Turnbuckle

Part No.	Name	Material	Length	Point "A"	Point "B"	Fairleads
40123-2	Rear Rudder	1/8" 7 x 19 Galv. Aircraft Cord	183 3/16"	40141	AN115-16	
40123-3	Aileron (Lower Horn)	1/8" 7 x 19 Galv. Aircraft Cord	168 5/16"	40141	AN115-16	41641
40123-5	Elevator (Upper Horn)	1/8" 7 x 19 Galv. Aircraft Cord	137 1/8"	40141	AN115-16	
40123-6	Elevator (Lower Horn)	1/8" 7 x 19 Galv. Aircraft Cord	136 1/2"	40141	AN115-16	
40123-7	Front Rudder	1/8" 7 x 19 Galv. Aircraft Cord	25 3/16"	AN115-16	AN115-16	
40123-28	Aileron (Upper Horn)	1/8" 7 x 19 Galv. Aircraft Cord	174 9/16"	40141	AN115-16	80022-42 41641

41671-2 Stabilizer Adjustment Cable 1/16 Inch Diameter 7 x 7 Galvanized Aircraft Cable. Endless.
Length Before Splicing 376 3/4 Inches; Circumference 208 3/4 Inches.

Figure 25—Cable Chart

Col 19

CAUTION

- Do not run the engine on either single magneto for periods longer than 30 seconds at a time.

The electrical system is not connected to the engine; it is used solely for the communication equipment. Check the following items:

BATTERY.—Battery condition. Use hydrometer; full charge registers specific gravity reading of 1.27. Replenish water in cells if needed. Do not add water to battery unless flight is intended so that the battery solution will be thoroughly mixed by the charge from the wind-driven generator.

FUSES.—See that each fuse on the fuse block, located on the battery case, is not blown; be sure the spare fuse is inserted in the holder.

TERMINALS.—Remove any corrosion that is found. See that each connection is tight.

MASTER GENERATOR AND BATTERY SWITCH BOX.—Turn on master switch; battery condition indicator on instrument panel will register about one-half scale for a fully charged battery. Turn on generator switch; generator should run; this is due to its motor action.

WIRES AND CABLES.—See that all wires and cables are properly insulated and securely fastened.

FUEL SYSTEM

Close shut-off valve.

Remove glass bowl from fuel strainer; empty contents and wipe clean. Flush a small amount of gasoline through filter screen by opening fuel shut-off valve. Close fuel shut-off valve.

Replace bowl and tighten nut on bail. Safety nut.

CAUTION

Do not use pliers to tighten nut; draw nut as tight as possible with the fingers only. Excessive tightening of the nut only stretches the bail wire and causes a loose fit at the gasket. Be sure the bowl seats evenly on the gasket. If the gasket is in poor condition, replace it with a new one.

Col 19

Check all fuel line connections to see that they are tight.

CAUTION

Do not draw connections too tight as this will crack the fittings and cause leaks. A firm, snug fit is sufficient.

Check seams of gas tank for evidence of rust or corrosion. Replace tank if leaks are found.

OIL SYSTEM

See that the proper amount of oil is in the oil sump.

See that the connections in the oil pressure and oil temperature systems are tight.

See that the oil breather line is open and securely attached.

MANIFOLDS

See that exhaust and intake manifolds are securely attached and free from rust or corrosion.

PROPELLER

See that propeller is securely attached and safetied and free from nicks or dents.

Replace any propeller which is damaged.

POWER PLANT—GENERAL

ENGINE MOUNT.—Check engine mount and attachment bolts.

See that engine mount is free from cracks and that the various members are not bent.

See that attachment bolts are secure and the nuts properly safetied.

CAUTION

Do not draw nuts too tight as excessive tightening will put heavy stress loads on the bolts which may result in failure of the bolts. See Torque Tension Chart, figure 5, for recommended drawing tension.

DAILY INSPECTIONS—AIRPLANE GENERAL

COCKPIT

Col 30

See that accumulations of dirt are removed.

See that all fixed equipment is securely attached.

COCKPIT CONTROLS

See that the stick moves freely in all directions without excessive play.

Raise tail of airplane and check rudder action.

NOTE

The steerable tail wheel is connected directly to the rudder; thus it is impossible to move the rudder pedals when the tail is resting on the ground.

MOVABLE SURFACES

Check ailerons, elevators, stabilizers, and rudder.

Col 30

See that all movable control surfaces have free motion.

See that all hinge pins and cable connections are securely safetied.

Remove stabilizer inspection opening cover and see that the screw mechanism is free of dust accumulations and all nuts are securely safetied.

See that the fabric covering on the movable control surfaces is in good condition. Patch any small holes that are found.

FIXED SURFACES

Check wings and lift struts.

See that the wing covering is not punctured. Patch any small holes that are found.

Col 15

possible. If operation is unsatisfactory, replace the entire unit.

Be sure the filament switch is turned "OFF" before making any changes in the equipment.

Check antenna to see that all mechanical and electrical connections are in good condition.

Replace antenna wire if the strands are broken.

Remove dirt and grease from all insulators and fair-leads.

NOTE

Do not use carbon tetrachloride or any other solvent to clean the antenna wire.

See that the reel operates freely; if the reel needs lubrication, use sparingly of a grade that will not congeal at the lowest temperature at which the airplane will be used.

Col 22

IGNITION AND ELECTRICAL EQUIPMENT.

Remove all spark plugs and install serviceable plugs of an approved type.

Col 23

FUEL SYSTEM.

See that tank mounting straps are tight.

Remove finger strainer and outlet fittings. Clean strainer.

Col 31

COCKPIT.

See that seat structures are intact and all attachment bolts and nuts securely tightened and safetied.

See that seat canvases are not torn or loose.

See that first-aid kit is properly stocked.

See that the fire extinguisher is filled with carbon tetrachloride.

See that observer's desk is securely attached.

See that the map case, under the desk, the foot board, and the canvas enclosure are securely installed.

Col 32

FLIGHT CONTROL MECHANISM.

Inspect all control cables where they pass through fair-leads or over pulleys. Replace any fair-leads or pulleys that are worn and replace any cables that are beginning to fray.

Remove the belly inspection plates and inspect all control system parts.

Col 32

Inspect all turnbuckle barrels, AN155 series, for seasoning cracks.

Lubricate all control parts, pulleys, bearings, and hinges.

CAUTION

Do not lubricate the stabilizer adjustment cables as this will cause the cables to slip on the pulleys.

Col 33

MOVABLE SURFACES.

See that attaching pins are not worn or bent. Replace pins that show signs of wear or corrosion or are bent.

See that the stabilizer adjustment cable has sufficient tension. Adjustments can be made by drawing the idler pulley adjustment tighter.

CAUTION

Do not put too much tension on the stabilizer adjustment cable as this will cause excessive wear on the pulleys and also cause the adjustment screw mechanism to bind.

Col 34

FIXED SURFACES.

Remove the wing root fairings and check the wing hinge bolts and the spar fittings. Replace any wing hinge bolts which show signs of wear. Check wing drag wires for looseness Tighten any wire that is too loose.

CAUTION

When tightening drag wires, wrap the wire with friction tape. Hold the wire with a pair of pliers gripped over the wrapped tape and turn the nut on the end with a wrench. This precaution is necessary because scratches on the wire caused by the pliers may cause a failure of the wire.

See that wing-tip bows are not broken and are securely fastened to the spar ends and rib ends.

See that there are no dents in the wing leading edge.

Visually inspect the forked end clevis in the wing lift struts for cracks or bending.

500-Hour Inspection

Remove and magnaflux or fluorescent inspect wing lift struts forked clevis bolts.

ALPHABETICAL INDEX

SECTION IV
MAJOR COMPONENT PARTS AND INSTALLATIONS

1. WING.

a. GENERAL DESCRIPTION.—The wing spars are solid or laminated, Sitka spruce, Douglas fir, or yellow poplar; rectangular in cross section with plywood plates glued to the faces of the spars at the wing strut fittings. Very little maintenance is required on the spars other than an occasional inspection at the fittings to ascertain that no looseness exists in the fitting attachments.

b. DRAG BRACING.

(1) The drag bracing consists of tubular drag or compression struts bolted at the ends to the spars. At major overhauls of the wing panel, these compression struts should be inspected for corrosion or bowed condition.

(2) The drag wires are No. 6-40 tie rods with right-hand thread at each end. These tie rods are made of high strength steel and should not be replaced with soft steel wire. It is recommended that a regular inspection of the drag wire installation be conducted to insure proper rigging and to see that the end connections are in good condition and free from corrosion. In rigging the tie rods, care should be taken in adjusting the tension to avoid marring the rod with plier or wrench marks as any scratches may induce a fatigue failure. The lock nut at the end of the adjusting nipple should not be drawn up too tightly as a high stress may result. This comment also applies to rigging the tie rods. Pyralin grommets have been installed on the undersurface of the wing to facilitate inspection of the drag bracing.

c. WING RIBS.—The wing ribs, 12 of which are used in each panel, are constructed of aluminum-alloy drawn sections riveted together with Thompson-type rivets. The ribs are attached to the spars by means of wire brads. Past experience over a period of years indicates that the material used on the ribs is highly corrosion resistant. However, an occasional examination of the ribs to check for loose rivets or corrosion (particularly when the airplane is used in salt air atmosphere) is advisable. If any evidence of corrosion is noted, the continued advance of this may be forestalled by cleaning the surface and coating with Lionoil, AN Specification No. AN-TT-V-118, or any good grade of spar varnish.

d. LEADING EDGE.—The wing leading edge is covered with light gage aluminum-alloy sheet which extends back from the leading edge on upper and lower surfaces approximately halfway to the front spar. Aluminum-alloy channels between the sheet metal cover and the ribs add stiffness to the surface. The only maintenance necessary on the leading edge is an occasional examination for corrosion or looseness. Care should be taken in handling to prevent denting the aluminum cover sheets.

e. WING-TIP BOW.—The wing-tip bow is a formed ash strip attached to the front and rear wing spars by steel fittings. This member is also secured to the aluminum leading edge and to the trailing edge of the wing rib nearest the tip. Rough handling of the airplane on the ground may damage the tip bow, so care should be taken when handling by means of the wing tips to apply force only at the intersections of the spars and the wing tip bow.

f. AILERON FALSE SPAR.—The aileron false spar is a formed aluminum-alloy channel attached to the wing ribs by means of self-tapping sheet metal screws. Inspect the false spar to check for looseness of the attaching screws or corrosion. Be sure that all drain grommets in the wing trailing edge are kept open so that accumulations of moisture will drain out of the wing.

g. AILERON HINGE BRACKETS.—The aileron hinge brackets are made of tubing with sheet metal fittings for attachment to the wing spar and to the aileron false spar. These brackets must be kept securely attached to the wing structure and should be inspected occasionally for corrosion or looseness.

h. SPAR FITTINGS.—The spar butt fittings and strut fittings are made of carbon steel plates and are bolted to the spars with AN standard steel bolts. An occasional inspection to see that all nuts are drawn snug should be made. At this inspection period the bolts attaching the wings to fuselage should be examined to see that they do not have excessive play and that all nuts are cottered.

i. LIFT STRUTS.

(1) The lift struts are streamlined tubes attached to the wing and fuselage by means of AN standard steel bolts. In inspecting the struts, check for nicks or dents and see that the jury strut attaching clamps are in place. It is only necessary to draw jury strut clamp bolts snug, as excessive tightening may break the bolt or crush the wing lift strut.

(2) In handling the airplane on the ground, care should be taken to prevent damage to the lift struts by pushing or lifting in the middle of the strut. Frequent inspections for corrosion of the struts should be made and if any corroded spots are found, these should be sanded down to the bare metal with fine sandpaper

spillproof-type battery, battery indicator on instrument panel, wind-driven generator, transmitter, receiver, and master control switch box on both models.

b. BATTERY.

(1) The battery is located in a metal case just back of the fire wall and should be kept fully charged at all times (1.275 to 1.300) as there is some danger of freezing of the electrolyte or liquid in cold weather if the battery is undercharged. Battery should be removed and recharged when specific gravity is below 1.240. Distilled water should be added to the battery only before the airplane is to be used, so battery will be recharged. The quantity added should be just sufficient to cover the plates to a depth of ¼ inch. Charging rate is 1 ampere.

(2) The battery is grounded to the fuselage and a complete two-wire system is used throughout.

7. COMMUNICATION SYSTEM (L-4A).

a. TRANSMITTER MAINTENANCE.

(1) The equipment has been carefully designed and strongly constructed and, with ordinary care, it should function in a satisfactory manner over a long period of time. The complete equipment should be inspected and cleaned every 60 days if the transmitter is used frequently. Use the following procedure:

(a) Check tubes. Use any modern tube tester.

(b) Clean relay contacts. Use carbon tetrachloride (Carbona) applied with a soft brush.

(c) Burnish contacts with a burnishing tool.

CAUTION

When cleaning relay contacts, do not distort the contact springs.

(d) Tubes are equipped with clamps to insure their permanent location in sockets. When replacing tubes, tighten these clamps just enough to insure positive contact between the flange on the tube and the arm of the clamp.

(e) When making extensive ground tests, disconnect the aircraft battery and use an external battery of high-current capacity.

CAUTION

Never operate the equipment when the airplane is in the hangar, is being refueled, or is near fuel storage.

(f) Be sure to turn the filament switch "OFF" when making any changes in the equipment.

(g) Do not tamper with the vibrator unit. It is hermetically sealed and adjustment is impossible. If operation is unsatisfactory, replace the entire vibrator unit.

NOTE

The life of a vibrator unit is conservatively set at 200 hours of operation.

(h) Complete failure of the equipment to operate may be due to discharged storage battery, an open fuse, or any broken lead.

b. RECEIVER MAINTENANCE.—If the receiver fails to function in any of its operative positions check the applied voltage from the power supply unit and make certain that all switch contacts are securely made. Check tubes in a tube tester.

c. ANTENNA MAINTENANCE.—Complete inspection should be made at the time noted under general care.

(1) Inspect and tighten all electrical and mechanical connections.

(2) Remove dirt and grease from all insulators and fair-leads.

(3) Reel out antenna and check for broken strands. Replace antenna if broken strands are found.

NOTE

Do not clean wire with carbon tetrachloride or any other solvent.

(4) Inspect drag unit and replace it if it has become damaged.

(5) Reel should function with the minimum of oiling attention. If oil is needed, use sparingly of a grade of lubricating oil that will not congeal at the lowest temperature at which the airplane will be used.

SECTION VI

TUBING CHART

SYSTEM	PART No.	LENGTH	OD	WALL THICKNESS	MATERIAL	FITTINGS	NAME
Fuel	71301 71242-6	48 in.	⅛ in.	.032	Copper	105 x 2 Inverted Nut	Primer to fuel strainer
Fuel	72401 71242-7	42 in.	⅛ in.	.032	Copper	Imperial Brass Co. compression No. 2680	Primer to carburetor
Fuel	72432	11.625 in.	⅛ in.	.032	Copper	2 inverted nuts 105 x 6	Shut-off to strainer
Fuel	70322-2	15 in.	⅜ in. ID	AAF Spec No. 26577 Amend. 3	Syn Rubber	¼ in. male pipe ⅜ in. male swivel	Strainer to carburetor
Oil Pressure	PVA type 4 SNA reworked to 71061	6 in.	⅜ in. ID	PVA type 4SNA	Syn Rubber	Resistoflex hose assembly	Engine to oil-pressure line
Oil Pressure	82332-14	27.5 in.	¼ in.	.032	Copper	1 SAE nut 41 x 4 1 inverted nut 105 x 4	Gage to flexible hose connection
Hydraulic Brakes	82332-2	26.25 in.	¼ in.	.032	Copper	1 SAE nut 41 x 4 1 inverted nut 105 x 4	Brake to flexible connection
Hydraulic Brakes	71061-2	6 in.	3/16 in. ID	PVA type 4SNA	Syn Rubber	Resistoflex hose assembly	Flexible hose connection model L-4A and L-4B
	71061-3	11 in.	3/16 in. ID				Model L-4H
Oil Breather System	72393-2	2 in.	⅞ in.	⅛ in.	Syn Rubber	2-1 in. hose clamps	Connection hose
Oil Breather System	84332	19.25 in.	⅝ in.	.032	Aluminum	Connector hose 70541 clamp	Breather line

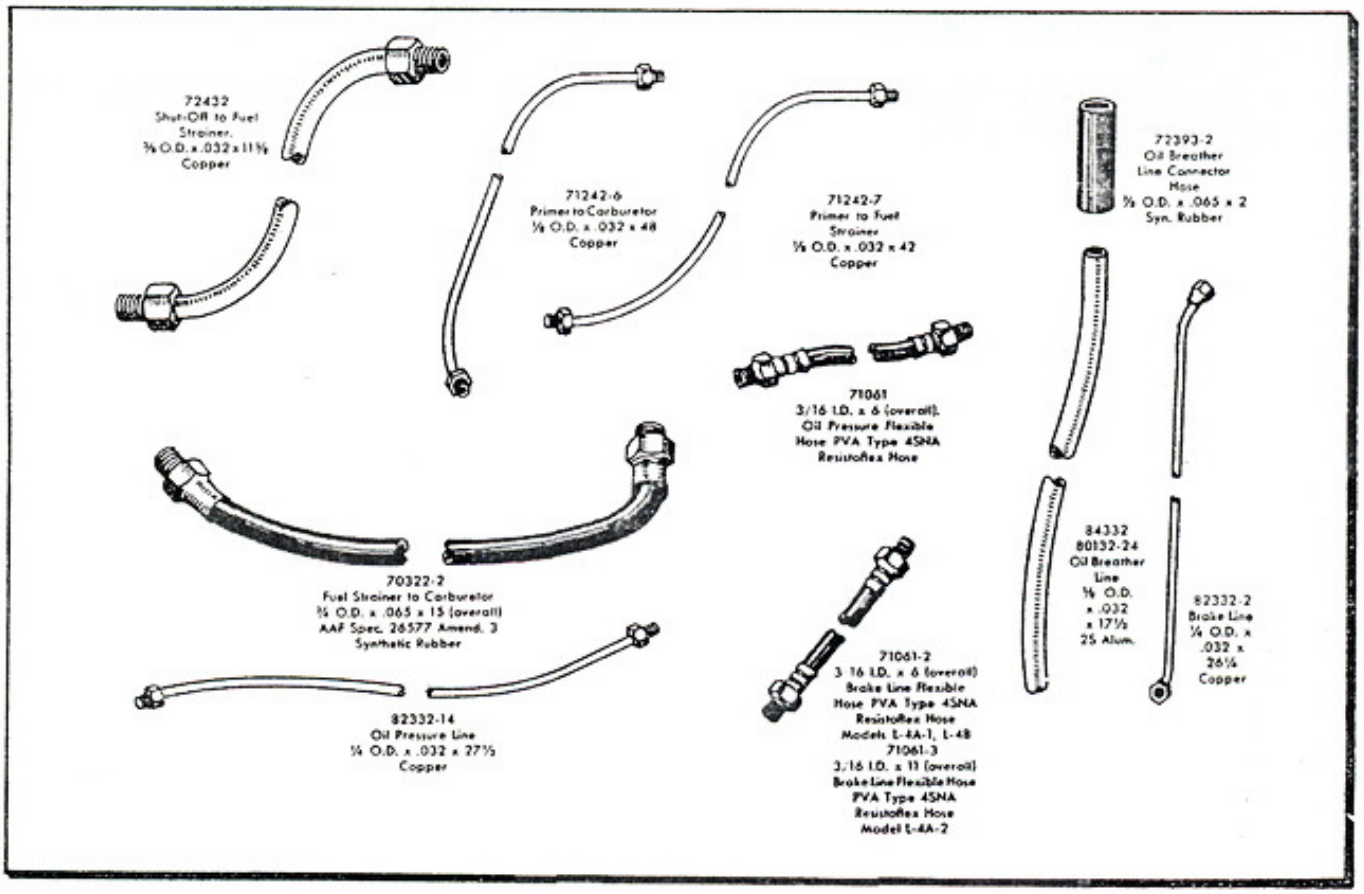


Figure 24—Tubing Chart

SECTION VIII

SERVICE INSPECTION

INDEX TO COLUMN NUMBERS

The inspections outlined in this section are arranged to correspond with the columns on Army Air Forces Form 41-B, the corresponding column numbers being found to the left of the pertinent paragraphs. The following index is provided for convenience in locating the inspections specified for the various component parts of the airplane.

Column		Column	
10	Preflight Inspection	30	Daily Inspections—Airplane
15	Communications	31	Cockpit
17	Navigation Equipment	32	Flight Control Mechanism
19	Daily Inspection (Power Plant)	33	Movable Surfaces
20	Engine Controls	34	Fixed Surfaces
21	Engine Instruments	35	Fuel Tanks
22	Ignition and Electrical	36	Tail Wheel Gear
23	Fuel System	37	Landing Gear
24	Oil System	38	Wheels and Brakes
27	Manifolds	39	Hydraulic System
28	Propeller	43	General—Airplane
29	General—Power Plant		

Results of these inspections will be recorded on Maintenance Inspection Record, Army Air Forces Form 41-B, which is maintained for each airplane in accordance with T. O. No. 00-20A.

PREFLIGHT INSPECTION

LINE INSPECTION

Col 10

COMMUNICATIONS

Check communication equipment. (L-4A.)

Check transmitter and receiver for proper operation.

CAUTION

Do not make tests of communication equipment while the airplane is in the hangar, while it is being refueled, or while it is near fuel storage. Use an external power supply if available.

NAVIGATION EQUIPMENT

Check compass and air-speed indicator.

Col 10

To check the compass, swing the tail in a circle, note motion of compass. Compass deviation card will show the corrected readings.

To check the air speed, have another mechanic breathe lightly across the opening of the pitot tube in the left jury strut.

CAUTION

It is only necessary to breathe very lightly across (not into) the pitot tube to cause the air-speed indicator to register. This will indicate that the instrument is in working condition.

DAILY INSPECTION—POWER PLANT

Col 19

ENGINE CONTROLS

THROTTLE.—See that throttle control levers, fuel shut-off control lever, primer pump, and carburetor heater control work freely.

TACHOMETER.—Check tachometer and oil temperature and pressure gages.

The tachometer should show 500 to 700 rpm for idling and 2050 to 2250 rpm for full throttle.

CAUTION

Be sure to have chocks in front of the wheels during engine check. Do not use full throttle until oil temperature reaches 32° C (90° F).

Col 19

The oil-pressure gage should register approximately 10 pounds per square inch during idling and approximately 35 pounds per square inch at full throttle. Maximum oil temperature should be 94° C (200° F).

IGNITION AND ELECTRICAL

Check ignition switch and electrical installation.

During the above test check the operation of the ignition switch by turning switch to each magneto "R" or "L" separately. A slight drop, approximately 50 rpm from the rpm when "BOTH" is used will be noted when the engine is running on each magneto separately.

Col 30 See that the lift struts are not bowed, dented, or rusted. Replace any struts that are damaged.

See that the lift strut attachment bolts and nuts are tight and properly safetied. Do not draw nuts too tight as this may tend to cause failure of the bolts. See Torque Tension Chart, figure 5, for recommended drawing tension.

TAIL WHEEL GEAR

See that tail wheel attaching bolts and nuts are securely tightened and safetied.

See that tail wheel is free to turn on the hub and on the steering spindle.

Remove any accumulations of dirt from the tail wheel mechanism.

CHECK LANDING GEAR.

See that all attaching bolts and nuts are securely tightened and safetied.

See that the various members are not bent or otherwise damaged.

See that shock cords are not broken and are in place on the shock struts.

WHEELS AND BRAKES

See that the tires are properly inflated; 16 pounds

Col 30 pressure is recommended.

Reverse tires on the same wheels which show considerable wear. Replace tires that are in poor condition.

See that brake lines are not dented or broken and see that the end connections are tight.

Check brakes for proper working condition.

NOTE

Stevens brakes are of the self-bleeding type and can be pumped to regain sufficient hydraulic pressure for proper operation. Scott brakes are not self-bleeding. See section III, paragraph 7. *c.* for procedure for bleeding Scott brakes.

FUSELAGE

See that fuselage tubes and stringers are not bent or broken.

See that covering is intact; patch any holes that are found.

See that tubes are free from corrosion or rust. Special attention should be directed to the tail post and the various fuselage cluster welds when checking for corrosion or rust.

PERIODIC INSPECTIONS

25-Hour Inspection

All items listed under Line Inspection, preceding, and the following:

Col 23 FUEL SYSTEM.—Remove drain plug from bottom of fuel tank to drain off any water which may have collected in the tank.

NOTE

Have the tail of the airplane on the ground. Place a container under the tank to catch the gasoline which will flow from the tank. This can be strained through a chamois skin to remove any water or other sediment.

Col 27 MANIFOLDS.—Remove exhaust manifold shrouds and check carefully for cracks or excessive scaling.

Col 29 ENGINE COMPARTMENT.—Remove engine cowling and remove dirt from engine and fire wall as well as inside surfaces of engine cowling. See that all tapes are secure and do not show signs of deterioration.

Col 31 COCKPIT.—Remove aileron pulley covers at floor board and check cables and pulleys for excessive wear. Replace any part that shows excessive wear.

See that safety belts are in good condition. Replace any that are frayed or have buckles that are not in good condition.

Col 32 CONTROL CABLES.—Check aileron and elevator cables to see that they are securely attached to the control stick.

Col 32 Check aileron cables at ailerons to see that the turnbuckles are safetied and are free to move in all directions.

Check elevator cables at elevator horn to see that turnbuckles are safetied and free to move in all directions.

See that all bolts and nuts connecting the cables to the various surfaces are properly tightened and safetied.

Col 43 ENCLOSURE SECTION.—See that all sections of the transparent enclosure are intact and that vision is not obstructed.

Replace broken sections and also those sections which have become weathered and do not permit clear visibility.

100-Hour Inspection

All items listed under Line Inspection and 25-Hour Inspection, preceding, and the following:

Col 15 COMMUNICATIONS. — Check communication equipment (approximately each third 100-hour inspection). (See section IV, paragraph 7.)

Test radio tubes in any tube testing equipment.

Replace tubes which do not show the proper operating condition.

Clean relay contacts. Use carbon tetrachloride (carbona) applied with a soft brush.

CAUTION

When cleaning relay contacts, do not distort the contact springs.

Do not tamper with the vibrator unit. It is hermetically sealed and adjustment is im-

APPENDIX I
U. S. A.-BRITISH GLOSSARY OF NOMENCLATURE

U.S.A.	BRITISH
Airfoil	Aerofoil
Airplane	Aeroplane
Airplane, observation	Reconnaissance aeroplane
Angle of stabilizer setting	Tail-setting angle
Battery, storage	Storage battery or accumulator
Carburetor heater	Intake air heater
Clevis	Fork joint, or knuckle joint end
Copilot	Second pilot
Cotter Pin	Split pin
Cylinder (hydraulic)	Jack
Fairing	Fillet
Gasoline (gas)	Petrol
Gross weight	All up weight
Landing gear	Alighting gear
Lock Washer	Spring washer
Pan, oil	Crankcase sump
Shrouds	Heating Muffs
Stabilizer (horizontal)	Tail plane
Stabilizer (vertical)	Fin
Stabilizer Adjustment Screw	Tailplane Adjusting Gear
Stack	Pipe, single (exhaust)
Strut, oleo	Compression strut
Tube (radio)	Valve
Valve (fuel)	Cock
Weight Empty	Tare