

# *Executive*

## **REFERENCE MANUAL**



MANUFACTURED BY  
**SPARTAN AIRCRAFT COMPANY**  
TULSA, OKLAHOMA  
U. S. A.



REFERENCE MANUAL  
FOR THE  
SPARTAN EXECUTIVE

PRICE: \$3.00 PER COPY

SPARTAN AIRCRAFT COMPANY  
TULSA, OKLAHOMA  
U. S. A.

## FOREWORD

The fact that you have purchased a new Spartan Executive is an indication to us that you have a keen appreciation for a better flying, well designed, and carefully manufactured airplane.

The Spartan Aircraft Company has the utmost confidence in the ability of this airplane to fulfill your flying needs.

In order to acquaint you with the various items pertaining to service and operation of your Executive, we have prepared this manual.

We sincerely hope it will help enable you to enjoy many hundreds of flying hours.

Engineering and Manufacturing  
Departments.

SPARTAN AIRCRAFT COMPANY.

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## **PILOT'S RESPONSIBILITY**

### **ENGINE**

Because this airplane is equipped with a new engine having a 10-to-1 ratio supercharger, it is important to the engine's protection that immediately after take-off it be throttled down sufficiently to prevent overheating. Engine operation at full take-off horsepower is limited to one minute.

Do not sacrifice air speed for climb.

The throttle should be opened and closed gradually because of the high ratio supercharger.

Every safeguard should be made against dust.

NOTE: Spartan Aircraft Company will not be responsible for damage to engines unless these directions are carried out.

### **AIRPLANE**

Never exceed an airspeed of 257 miles per hour.

Do not extend flaps at speeds in excess of 125 miles per hour.

Do not attempt to retract landing gear at speeds exceeding 125 miles per hour.

Do not throw landing gear retracting switch to up position until you are absolutely sure that the airplane is clear of the ground and is not apt to settle.

### **EMERGENCY TOOLS**

Spartan Aircraft Company has always tried to use good common sense, as reflected in the sturdily built Executive, about the concern of precaution for those who fly. In keeping with this policy we urge that the pilot always carry at least a pair of pliers and a screw driver along in the airplane. A convenient carrying place for these tools is in the map case where they are easily available.



## WARRANTY

Spartan Aircraft Company extends warranty for a period of ninety (90) days on all Spartan airplanes in regards to parts of the airplane manufactured in the Spartan Factory. Should any of the aforementioned parts be found defective due to material and workmanship under normal use and service, and returned to us with transportation prepaid, within the time limit specified herein, Spartan Aircraft Company under obligation of this warranty is limited to making good the part, or parts, after examination, or investigation of integral facts, to our satisfaction it/they is/are decided defective; this warranty being expressly in lieu of all other warranties expressed or implied, and of all other obligations or liabilities on our part, and we neither assume nor authorize any other person to assume for us any other liability in connection directly or indirectly with the sale of our airplanes.

This warranty does not cover any labor charges for adjustments, repairs, replacement of parts, nor any service charge incurred against Spartan airplanes.

This warranty shall not apply to any Spartan Airplane which has been altered or repaired outside of our factory in any manner so as, in our judgment, to affect the reliability of the airplane or parts involved, nor which has been subjected to misuse, negligence, accident, operation in violation of governing aircraft regulations, or failure to follow recommendations set forth by factory instructions.

Spartan Aircraft Company makes no warranty with respects to tires, wheels, ignition apparatus, starting devices, generators, batteries, instruments, lighting fixtures, motors, radio equipment, or other accessories which are not manufactured by our factory, inasmuch as they are usually warranted separately by their respective manufacturers.

Spartan Aircraft Company reserves the right to alter, add to, omit from, or redesign any component parts of Spartan Airplanes without incurring any obligations to furnish or install the same on existing airplanes or component parts thereof.

SPARTAN AIRCRAFT COMPANY,  
Tulsa, Oklahoma, U. S. A.



## ORDERING PARTS

### HOW TO ORDER PARTS

To give you a clearer understanding of the information needed by our Service Department for prompt shipment of parts, we have outlined the following:

- (1) State to whom the shipment is to be made, address where parts are to be sent, and whether to send by Parcel Post, Air Mail, Air Express, Express or Freight.
- (2) State airplane and engine serial numbers.
- (3) State quantity needed.
- (4) State the part number and name of part. If neither of these are available, give as complete a description as possible of the part. A sketch will aid materially.
- (5) Parts will be shipped C. O. D. unless a cer-

tified check or money order accompanies order.

### RETURN OF PARTS

Parts being returned for replacement, repair, or credit should be accompanied by a letter stating reason for return with airplane and engine serial numbers, number of hours of service of parts and any additional information that you might think would help us to determine the trouble. Transportation charges must be prepaid.

### PRICES

Prices are subject to change without notice. A list of part prices may be had from our Service Department upon application.

NOTE: In order to avoid delays, all communications should be addressed to the attention of the Service Department.



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## GENERAL DATA

### DESIGN SPECIFICATIONS

Overall Span	39 ft.
Airfoil Section, Root (center-line of ship)	N.A.C.A. 2418
Airfoil Section, Tip (theoretical)	N.A.C.A. 2406
Wing Area (including ailerons)	250 sq. ft.
Incidence	1°-20'
Dihedral (chord plane)	5°-30'
Mean Aerodynamic Chord	79.3 in.
Aileron Area	22.18 sq. ft.
Fin Area	9.74 sq. ft.
Rudder Area	10.02 sq. ft.
Stabilizer Area	21.84 sq. ft.
Elevator Area	16.80 sq. ft.
Overall Height (tail down)	8.0 ft.
Overall Length	26.0 ft.
Engine—Pratt & Whitney Wasp Jr. S. B.	
Rated Power at 2200 RPM at 5000 ft.	400 H.P.
Rated Power at 2300 RPM sea level (take-off)	450 H.P.
Propeller Diameter	8 ft. 6 in.
Wing Loading	17.6 lb./sq. ft.
Power Loading	11.0 lb./H.P.
Tread of Landing Gear	10.0 ft. 3 7/8 in.
Size of Wheels (Goodyear)	27 in.
Size of Tail Wheel (Streamline)	10.5 in.

### PERFORMANCE

Performance at Sea Level	
High Speed (33 1/2 in. Hg.— 2300 RPM)	212 Mph.
Angle of Climb	7 1/2°
Rate of Climb (36 1/2 in. Hg.— 2300 RPM)	1430 ft./min.
Landing Speed (Flaps down)	65 Mph.
Take-Off Run	600 ft.
Performance at Critical Altitude (5000 ft.)	
High Speed (33 1/2 in. Hg.— 2300 RPM)	212 Mph.
Rate of Climb	1080 ft./min.
Climbing Speed	128 Mph.
Time of Climb to Critical Altitude (5000 ft.)	4 min.
Performance at Cruising Altitude (9600 ft.)	
High Speed (28 in. Hg.—2200 RPM)	208 Mph.
Climbing Speed	132 Mph.
Time of Climb to Cruising Altitude (9600 ft.)	9 min.
Cruising Speed at 75% rated power	200 Mph.
Cruising Speed at 65% rated power	190 Mph.

Endurance at 75% rated power	4 1/2 Hrs.
Endurance at 65% rated power	5 1/2 Hrs.
Range at 75% rated power	900 Miles
Range at 65% rated power	1000 Miles
Service Ceiling	24000 Ft.
Absolute Ceiling	26000 Ft.

The above data is based on the following conditions:

Gross Weight	4400 lb.
Octane of fuel (normal)	80
Octane of fuel (take-off)	87
Maximum Fuel Capacity	112 Gal.

### GENERAL WEIGHT INFORMATION

*Weight Empty—	
Standard Model	Approx. 3021 lb.
Gross Weight Allowable (C.A.A. Regulation)	4400 lb.
Oil per Gallon	7 lb.
Fuel per Gallon	6 lb.
One Person (C.A.A. Regulation)	170 lb.
Baggage—Maximum Allowable (C.A.A. Regulation)	100 lb.
Minimum Fuel Supply at Take-Off (C.A.A. Regulation)	50 Gal.

\*—Weight Empty Varies With Equipment Installed.

### EXPLANATION OF LOADING PLACARD

To fulfill the requirement that all commercial airplanes must be provided with a loading schedule and equipment list, Spartan Aircraft Company has prepared a placard which can be varied according to the various installations of equipment as desired by the customer.

In reading your loading placard you will notice that full tanks (112 gallons), and full baggage (100 pounds) can always be carried with either the pilot by himself, or the pilot and one passenger.

For conditions ranging from pilot and two passengers, to pilot and four passengers, scales have been provided to show the pilot how much fuel he is allowed to carry for a given baggage load.

Due to the difference in equipment on various airplanes, the fuel supply will vary for a given passenger and baggage load.

Your particular loading placard was calibrated at the time your airplane was licensed by the factory.

After the loading scales follows a sentence saying, "Fill reserve tank first and use last except for take-off." This is very important to the balance of the airplane. Pilots should have their airplane filled with fuel, and use, in the following manner. First



fill reserve tank, second fill main (wing) tanks, and third fill auxiliary (fuselage) tanks. The fuel supply should be consumed in the reverse order. That is, run out the auxiliary and then switch on the main, and last use the reserve.

87 Octane should be used in the reserve tank as it is used for take-off, and the rest should be filled with 80 octane.

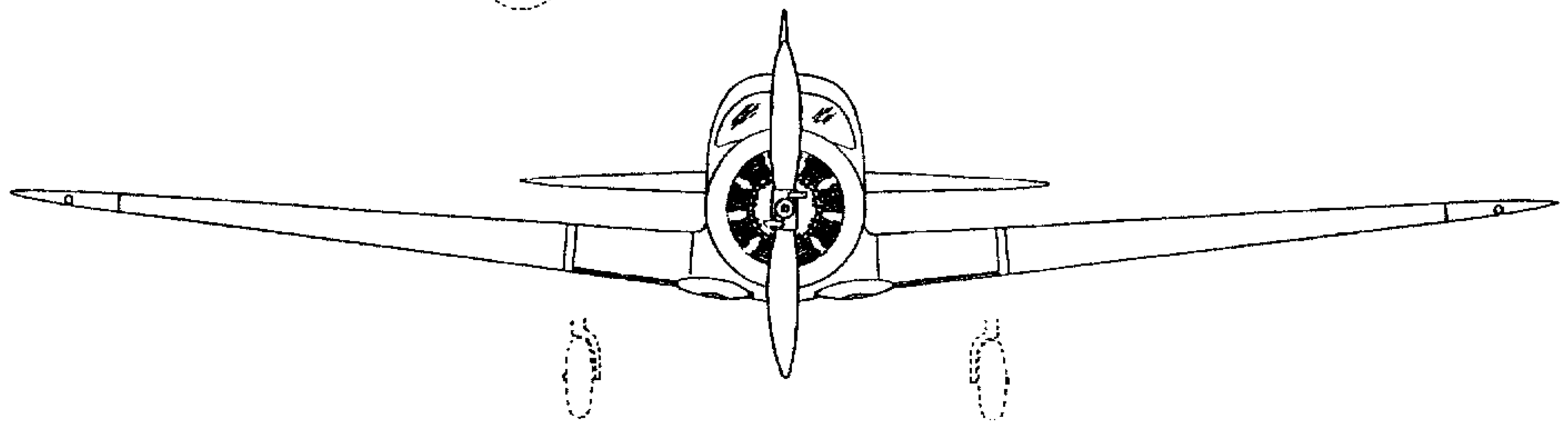
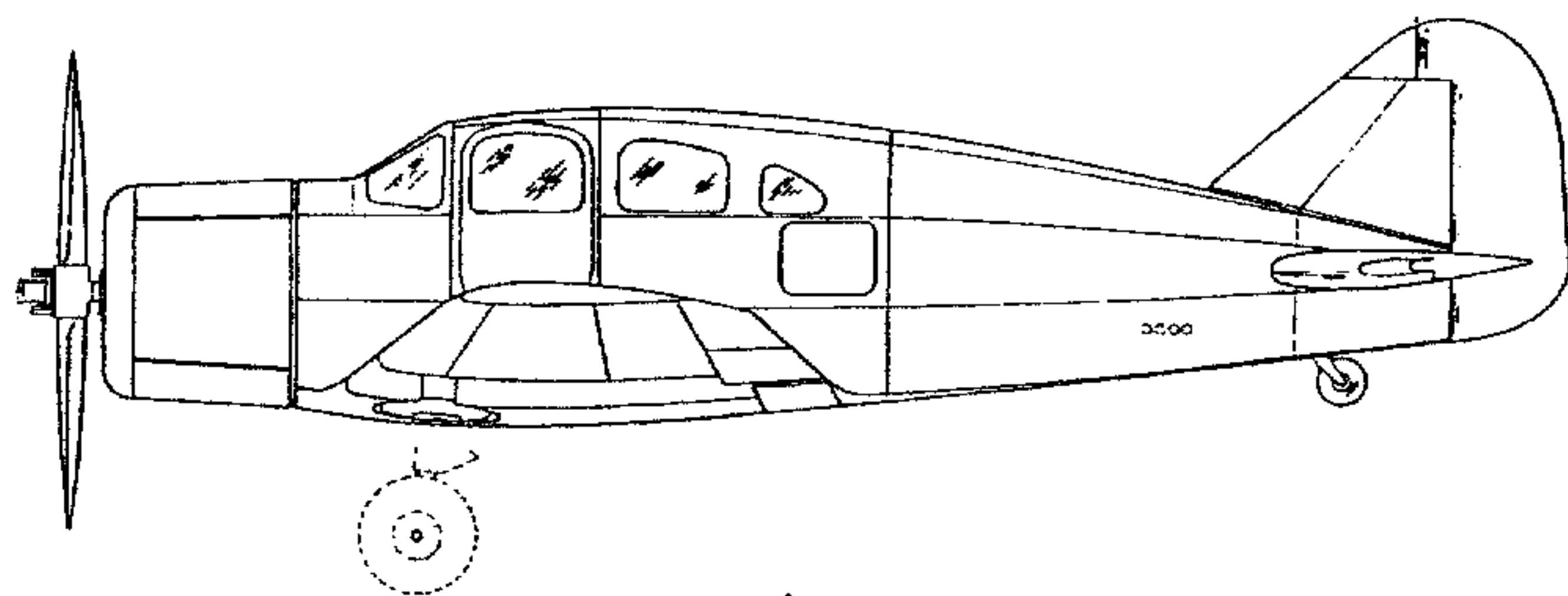
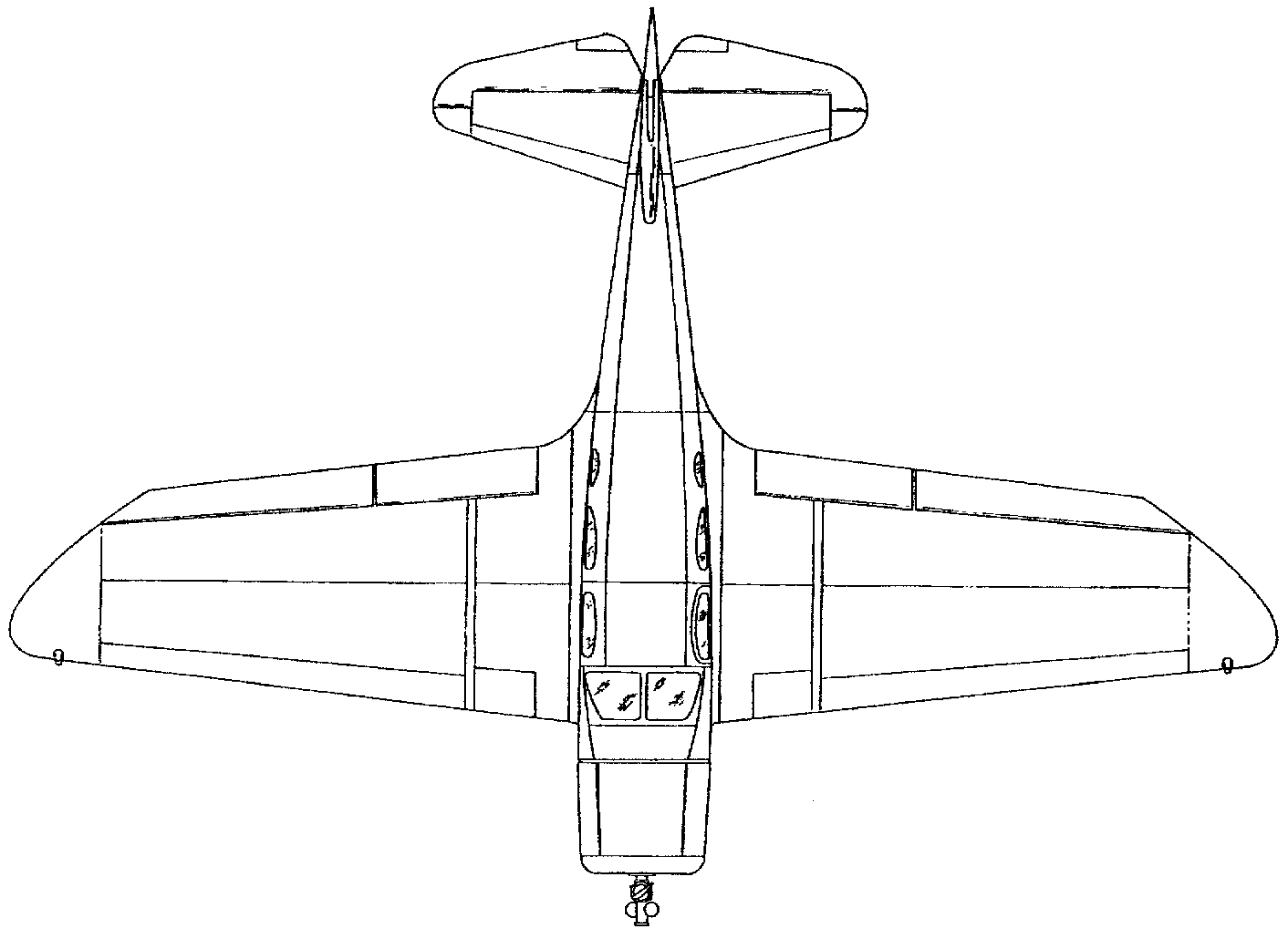
The next sentence on the placard, "7 gallons of oil to be carried at all times," merely means to see that the oil is always up to the proper level.

The "Equipment" list shows all items of equipment contained in/on your particular airplane, and gives the weight of the item and its distance, or arm, from the leading edge of wing rib number 2.

This list is continued on the reverse side of the placard and is signed by the local C.A.A. Inspector.

The loading placard is not valid unless properly signed by the Chief Engineer of Spartan Aircraft Company, the local C.A.A. Inspector, and the Chief of Airworthiness Section, C.A.A. When a license is granted, however, a temporary loading placard is used in the airplane until the final one comes back from the C.A.A.

NOTE: Whenever any equipment is added, altered, or removed, a new loading placard and a new weight and balance data must be prepared. Further information may be had by contacting Spartan Aircraft Company.



THREE VIEW DRAWING  
SPARTAN EXECUTIVE



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## GENERAL CLEANING CARE

### CLEANING CARE OF THE AIRPLANE

- (1) Exposed aluminum alloy surfaces (Body, wings, fairings, etc.)

Oil and grease is usually removed from these surfaces by washing down with a cheap grade of gasoline. (High octane gasoline is dangerous to use in contact with human skin.)

For polishing these metal surfaces, Spartan Factory recommends Magnus Metal Polish, diluted with water in a four to one ratio. That is, using four parts water and one part Magnus Metal Polish.

- (2) Cloth surfaces (Rudder, elevator and ailerons).

Wash down with a solution of Lux suds and wipe dry immediately. This has been found to be the most successful way to remove dirt, grease and oil.

- (3) Rubber surfaces (Tires, walkways, etc.)

Dirt, grease and oil may best be cleaned from these surfaces by washing down with a solution of Lux suds in the manner in which cloth surfaces are cleaned.

- (4) Instrument Panel and Interior Trim (all painted surfaces).

These surfaces are recommended to be cleaned and polished in the conventional manner with Sherwin-Williams Opex Polish No. 28250.

- (5) When an airplane is operated around sea water.

Due to the excessive corrosion action of sea water or the salt moisture in the air in the vicinity of sea coasts, an airplane operating under these conditions should be washed down with fresh water.

- (6) Upholstery and Carpets.

Vacuum cleaning of these will aid in retaining neatness, and will actually keep the colors brighter.

### STAINS

#### NAUSEA STAIN

If possible, before the stain has a chance to dry, sponge with a clean cloth wet with clear cold water. After most of the stain has been removed this way, wash lightly with soap, using a clean cloth and luke-warm water. Should any stain remain after this treatment, rub clean with a cloth which has been moistened with carbon-tetrachloride.

#### URINE STAIN

Sponge stain with a clean cloth wet with luke-warm soap suds, then rinse well with a clean cloth and cold water. Subsequently, pour on the spot a mixture of one part household ammonia water and five parts of water. Allow to remain for 1 minute then rinse by rubbing with a clean wet cloth.

#### FRUIT OR WINE, AND LIQUOR STAINS

Fruit stains of practically all kinds can be removed by treatment of very hot water. Wet the stain well by pouring a little hot water directly on the spot. Scrape all excess pulp off the fabric with a dull knife. If this treatment does not suffice, sponging with a clean rag wet with carbon-tetrachloride is the only further treatment recommended.

#### LIPSTICK STAINS

The composition of different brands of lipsticks vary; therefore, some lipstick stains may be removed more easily than others. Pour a little chloroform or carbon-tetrachloride on the stain and immediately press a blotter firmly on the spot. Repeat the procedure using new sections of blotting paper until blotter no longer shows stain.

#### WINDSHIELD AND CABIN WINDOWS

The windshield and cabin windows of the Executive are made from Plexiglass, an acrylic sheet plastic. While this product is considered the best material available for the purpose, great care should be given in cleaning of the surfaces.

- (1) Removing Dirt and Grease.

When the surfaces become soiled with oil and grease, solvents for these substances, such as kerosene or naphtha, may be used. A water solution such as Dreft or Drene may be used. These compounds are available at any drug or department store. A small quantity of Dreft or Drene is dissolved in water, making a very soapy solution. This solution is then applied to the surface with a soft cloth in a manner similar to cleaning window glass, and then rinsed with clear water and dried.

- (2) Polishing out Minor Scratches.

The most effective cleaner for removing minor scratches is Simoniz Kleener, a well known commercial product. The Kleener is applied with a damp, soft cloth, and only the scratched area is rubbed vigorously. Caution must be taken not to rub in one place too long, as friction will build up heat and cause ridges. Rub both in the direction



of, and at right angles to the scratch. Several applications may be necessary. When scratches are removed, or considerably improved, remove the Kleener with a damp soft cloth. Simoniz Polish should next be applied. Use about a half a yard of soft cloth. Wet it, wring it almost dry, and fold it into a pad about 6 inches square. Apply polish to the surface evenly and thoroughly. Let it dry a few seconds, then rub lightly with a dry soft cloth. Polishing cloths should be clean, soft and grit free. It is

recommended that new cloths be washed with soap and clean water, rinsed thoroughly and allowed to dry in a dust free room.

#### **DRAIN HOLES IN BOTTOM OF FUSELAGE, WINGS AND TAIL SURFACES**

These small drain holes are provided to drain off any excess moisture which is apt to collect due to condensation or other causes. These holes must be kept open for protection of the structure.

## SECTION II — WING GROUP

### WING STRUCTURE

The basic structure of the wing is a triangular steel tubing beam, or spar, consisting of two upper chord members, a lower chord member, cross members, and diagonal members. All tubing in this assembly is heat treated to 125,000 pounds per square inch tensile strength.

**CAUTION!** Before attempting to repair or weld any part of this structure, Spartan Aircraft Company should be consulted. Never weld or apply heat to the middle section of any tube or attempt any "sleeve" repair installations without consulting the factory.

The wing ribs are of the channel capstrip type, being made from 24ST Alclad aluminum alloy.

The stringers are the "J" section type made from 24ST Alclad aluminum alloy.

All outside skin of wing panel is 24ST Alclad aluminum alloy.

Rivets are 17ST.

### WING TIP STRUCTURE

The wing tip is a typical all metal structure comprised of ribs, stringers, and skin.

The skin is formed from 24ST Alclad aluminum alloy sheet.

The rib is 24ST Alclad aluminum alloy.

The stringers are 24ST Alclad aluminum alloy.

The rivets are 17ST.

The wing tip is attached to the wing panel with machine screws.

### WING FLAP STRUCTURE

The structure of the wing flap consists of ribs, stringers, and external skin. These parts are 24ST Alclad Aluminum Alloy.

The rivets are 17ST.

### AILERON STRUCTURE

The frame consists of Aluminum Alloy ribs riveted to a steel-tube main spar, and an Aluminum Alloy leading and trailing edge.

The ribs and leading edge are 24ST Alclad Aluminum Alloy.

The spar assembly is Chrome-Molybdenum (X-4130) steel.

The rivets are 17ST.

The frame is cloth covered.

### TO REMOVE A WING

- (1) Remove aileron.
  - (a) Disconnect control tube.
  - (b) Disconnect hinges.

- (2) Remove wing flap.
  - (a) Remove outboard rear plates on bottom of fuselage.
  - (b) Unsafety and remove nut from taper pin on torque tube.
  - (c) Remove small inspection plate on wing walk and drive taper pin through this opening.
  - (d) Disconnect flap hinges.
- (3) Remove large inspection panel at landing gear point on wing leading edge.
- (4) Remove upper and lower wing gap plates.
- (5) Remove vent sheet gap plates.
- (6) Disconnect navigation light and landing light wiring.
  - (a) Disconnect Air Speed Pitot Head wiring (Left wing only).
  - (b) Disconnect Outside Air Temperature Bulb wiring (Right wing only).
- (7) Disconnect cabin ventilation cold air duct tube (Right wing only).
- (8) Disconnect Air Speed tubing.
- (9) Disconnect Aileron control cables.
- (10) Remove landing light assembly.
- (11) Remove landing gear "Bungee" (shock cord).
  - (a) Remove retainer collar that holds shock cord spool in wing.
  - (b) Through the landing light opening, run a  $\frac{3}{4}$  diameter rope and attach to the shock cord.
  - (c) Have at least two men to pull outboard on the rope, until the spool can be slipped from place, and then gradually slack upon the cord until no tension remains.
  - (d) Apply penetrating oil to wing attachment taper pins.
  - (e) Remove taper pins.
  - (f) Wing must be removed in its own plane outboard to prevent damage to ends of fuel tanks.

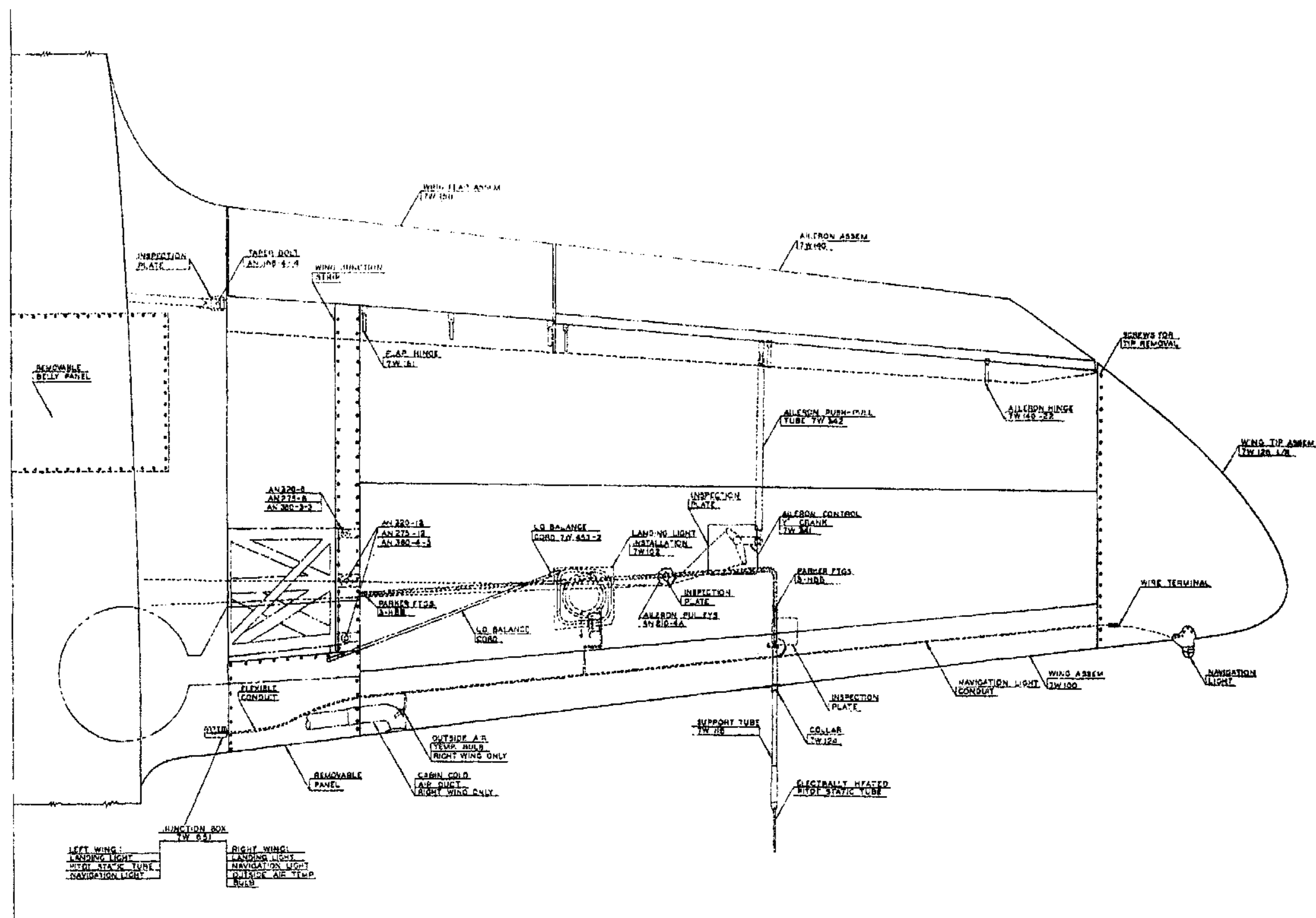
- NOTES: (1) When reassembling, wing attachment taper pins should be coated with white lead or some good non-seizing, non-acid compound.
- (2) Extreme caution must be used when handling wing so as not to damage or misalign the static pitot head. This head must be absolutely in line of level flight in order to get the correct air speed reading.

### TO REMOVE A WING TIP

- (1) Remove attaching screws.
- (2) Pull wing tip carefully, part way, and disconnect navigation light wire before proceeding the rest of the way.



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WING INSTALLATION  
SPARTAN EXECUTIVE



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### SECTION III — TAIL GROUP

#### STABILIZER AND FIN STRUCTURE

The stabilizer and fin both are full cantilever. The structure of these two surfaces is of the multicellular, monocoque type fabricated from 24ST Alclad aluminum alloy except the tips which are 52SH aluminum alloy. 17ST rivets are used in the main structure and 53ST rivets are used in the tip structure only. These surfaces are attached to the fuselage by an angle section, the units being securely riveted together. The stabilizer tips are easily removable for inspection or replacement.

#### RUDDER AND ELEVATOR STRUCTURE

Both the rudder and elevator structure consists of an aluminum alloy frame riveted to a main steel-tube spar. The ribs and leading edge are 24ST Alclad aluminum alloy and the spar is Chrome-Molybdenum (X-4130) steel. 17ST Aluminum alloy rivets are used throughout. The entire structure of both surfaces is fabric covered similar to the aileron structure. The rudder is dynamically balanced and the elevator is statically balanced. Both are aerodynamically balanced.

#### TO REMOVE ELEVATORS

- (1) Remove two inspection plates on each side of fuselage.

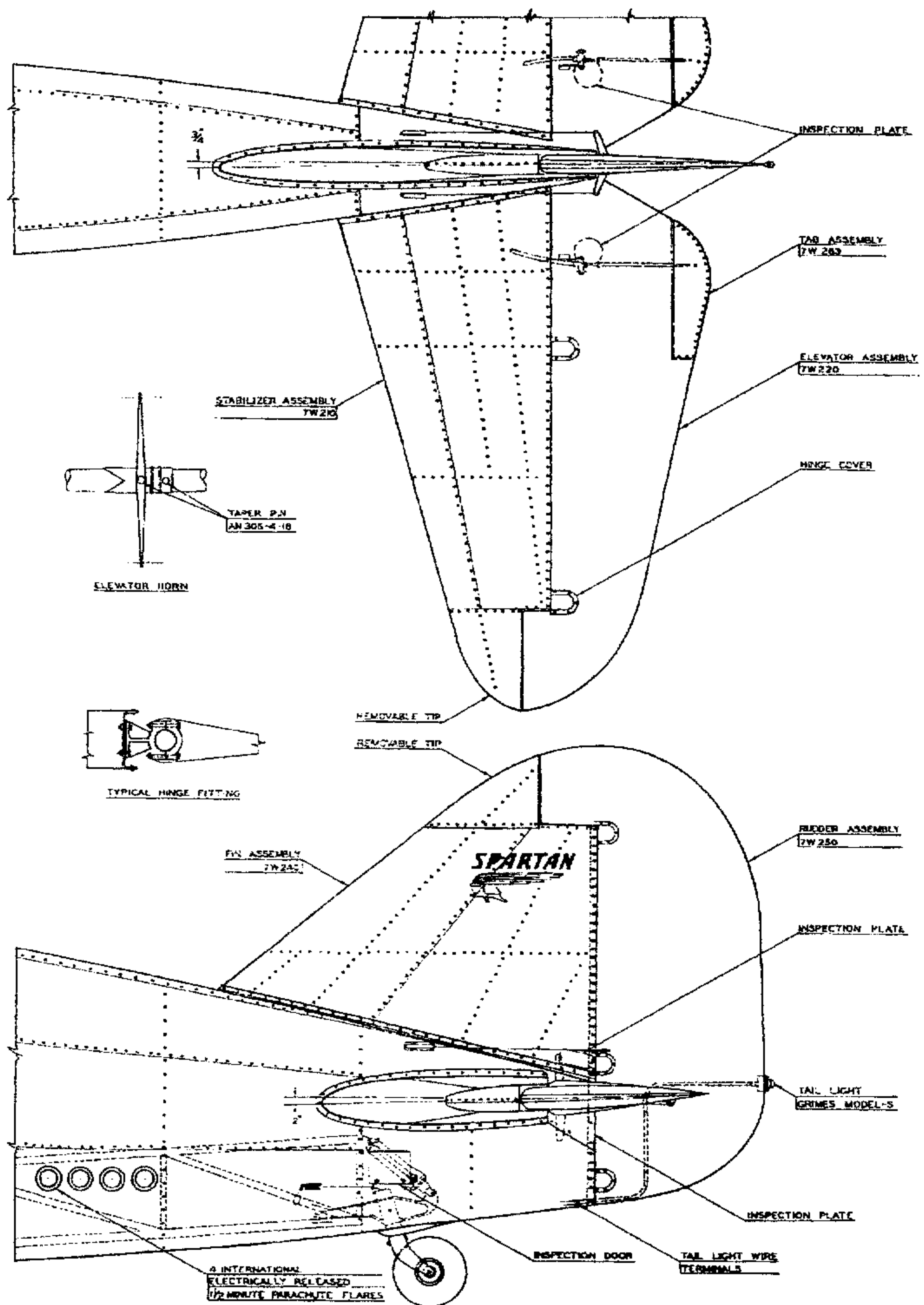
- (2) Remove one inspection plate on each bottom surface of elevators and disconnect tab drives.
- (3) Remove control cables from elevator horns, being sure to tie safety wire to cable end for retrieving on reassembly.
- (4) Remove cotter pins and nuts from taper pins.
- (5) Remove hinge cover plates.
- (6) Remove hinge bearing caps on both elevators.
- (7) Pull elevators aft to fin post and drive out taper pins.
- (8) Work elevators apart and remove.

#### TO REMOVE RUDDER

- (1) Remove rudder control cables and tie together with safety wire.
- (2) Remove hinge cover plates and remove hinge bearing caps.
- (3) Disconnect tail light navigation wire terminals.
- (4) Remove rudder.

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## TAIL GROUP INSTALLATION

SPARTAN EXECUTIVE

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## SECTION IV — SURFACE CONTROLS GROUP

### ELEVATOR CONTROL SYSTEM

#### General Description

The Executive control system is extremely simple throughout. A push-pull tube runs from the bottom of the control column to a bellcrank which is provided with adjustable stops. From here two cables run aft over a series of pulleys, and through fairleads, to the elevator horn.

#### Maintenance

Due to its inherent ruggedness and simplicity, this system needs very little maintenance aside from regular routine inspection and lubrication. (See Lubrication Chart.)

### AILERON CONTROL SYSTEM

#### General Description

Housed in the control column, and operated by the control wheel, is a complete chain drive mechanism. The chain comes out of the control column just below the column attachment point. Here a cable is joined to the chain, which, in turn, goes over a series of pulleys to the aileron control bellcrank in the outer part of the wing. From this bellcrank a push-pull tube runs to the aileron horn which is located on the lower surface of the aileron. Adjustable stops for the system are provided at the aileron bellcrank.

#### Maintenance

Like the elevator system this mechanism requires practically no maintenance other than routine inspection and lubrication. (See Lubrication Chart.)

### RUDDER CONTROL SYSTEM

#### General Description

A dual set of rudder pedals are provided. The left hand set of pedals are of the fixed type while the right hand set fold back out of the way when not in use. Running forward from the rudder pedal horns is a balance cable which completes a circuit around a large diameter pulley located just aft of the firewall. Going aft from these same horns are two cables, which, after running over a series of pulleys and fairleads, finally attach to the rudder horn.

#### Maintenance

Practically no maintenance is required other than routine inspection and lubrication. (See Lubrication Chart.)

### ELEVATOR TAB CONTROL

#### General Description

The tab control knob is located on the center-line of the instrument board and is an integral unit with the specially designed Spartan engine control. The direction of rotation for nose up and nose down

are plainly indicated. To lower the nose of the airplane turn the knob to the right. You will notice the indicator pointer on the instrument panel automatically moves downward. This indicator conveniently tells you the tab position by a glance.

A drive runs from the knob to the indicator mechanism and on through to a drum, or spool, upon which the control cable is wound. This spool has a threaded surface to insure perfect tracking of the cable. This is clearly shown by the engine and tab control illustration in the Power Plant group — Section VII. The manner in which the cable is wound is also shown.

Control cables are used from the spool on through the fuselage to the tab drive drums on bulkhead number 9. This is shown, along with method of winding the drums, on the Control System illustration. The drums, or spools, at bulkhead number 9 in turn drive a flexible control which turns the non-reversing drive screw inside of the elevator. A push rod runs from the drive screw to the tab horn.

#### Maintenance

In general the tab control system requires very little service. Should the system become abnormally stiff in operation, the trouble may be due to misalignment in the drive screw mechanism inside the elevators.

When oiling any part of this system use only SAE 10 oil or a light grade of machine oil.

### FLAP CONTROL SYSTEM

For schematic operation of the wing and center flap control system see installation of the Control System.

#### General Information

The Executive has two wing flaps and a center flap. The wing flaps act as one unit and may be operated independently of the center flap. The two operating levers are located on the center-line of the instrument panel and are plainly labeled to show operation. These two levers are so located in relation to each other that the pilot may use two fingers to operate all flaps in unison, or one finger in case of selection.

#### Description and Function of the System

Directly aft of the baggage compartment bulkhead on the right hand side of the airplane is located the vacuum reserve tank. A line runs from this tank to a ball check valve and then to the engine intake manifold. In this same line, between the check valve and the tank, a tee is installed. A line running from this tee is then connected to a second tee. Two lines from the second tee then run to each of the four-way flap cylinder operating valves. In referring to the schematic diagram you can readily see that each cylinder has a complete



system of its own after branching off from the second tee. Suppose we take the top cylinder in the diagram. This is the wing flap and is shown as the flap lowering. As may be seen, atmospheric pressure is acting through the "vent to atmosphere" directly on one side of the actuating piston. The other side of the piston is open to the vacuum tank. Thus we have a pressure (atmospheric) acting on one side of the piston, and a suction, or negative pressure (due to the vacuum) on the opposite side of the piston. This causes the piston to move in the direction of the vacuum side and in turn lowers the flap. The flap piston works on the same principal when the four-way valve is rotated to the up position.

Each of the four-way valves are remotely controlled through a system of cables and pulleys by the levers on the instrument panel.

The wing flaps are held in the up position in the following manner. On the main control system drawing find part 7W 306 (arm assem.—left). This arm is fastened to the wing-flap valve. A small spring-loaded catch on this arm is engaged with the wing flap torque tube horn and thus retains the flap in the up position. When the lever on the instrument panel is moved to the down position, the pull of the cable on this arm automatically disengages the catch at the horn. At the same time, or rather slightly in advance, the valve is opened which allows the flap to lower.

The center flap is held in the up position by a simple spring-loaded ball-type latch. When the center flap valve is turned to the down position there is sufficient force to overcome the latch causing it to snap loose so that the flap may continue downward.

The check valve which was first mentioned as being in the line from the engine intake manifold to the reserve tank, has the following function. When the engine is idling, air in the vacuum reserve tanks and lines will be sucked into the engine. When the throttle is opened, the ball-check immediately closes and the vacuum in the tank and lines

is retained. With this reserve vacuum supply, the flaps will lower whether the engine is running or stopped.

#### Maintenance

Maintenance requirements are very slight on this system. General routine inspection and lubrication care (See Lubrication Chart) should be done regularly.

The only likely point of trouble may arise at the check valve in the vacuum line. The seal is formed by a ball retained against a small port by a light spring. The force of the manifold vacuum unseats the ball against the spring. If the spring is too stiff, or if heavy grease, or dirt, causes the ball to stick to the seat the system will not function at all. If the spring is broken, or foreign particles hold the ball away from the seat, the flaps will operate only at idling speed of the engine.

**CAUTION! Do not exceed 125 miles per hour with flaps extended.**

#### TO REMOVE CONTROL COLUMN

- (1) Remove boot at base of column.
- (2) Remove ventilator covers on both sides of column.
- (3) Disconnect antenna reel and cable clip.
- (4) Remove right hand wheel well.
- (5) Disconnect aileron control cables at chain joint.
- (6) Disconnect elevator control tube.
- (7) Unsafety trunnion bolts and remove bolts with ratchet socket.
- (8) Remove column.

#### CARE OF CONTROL CABLES

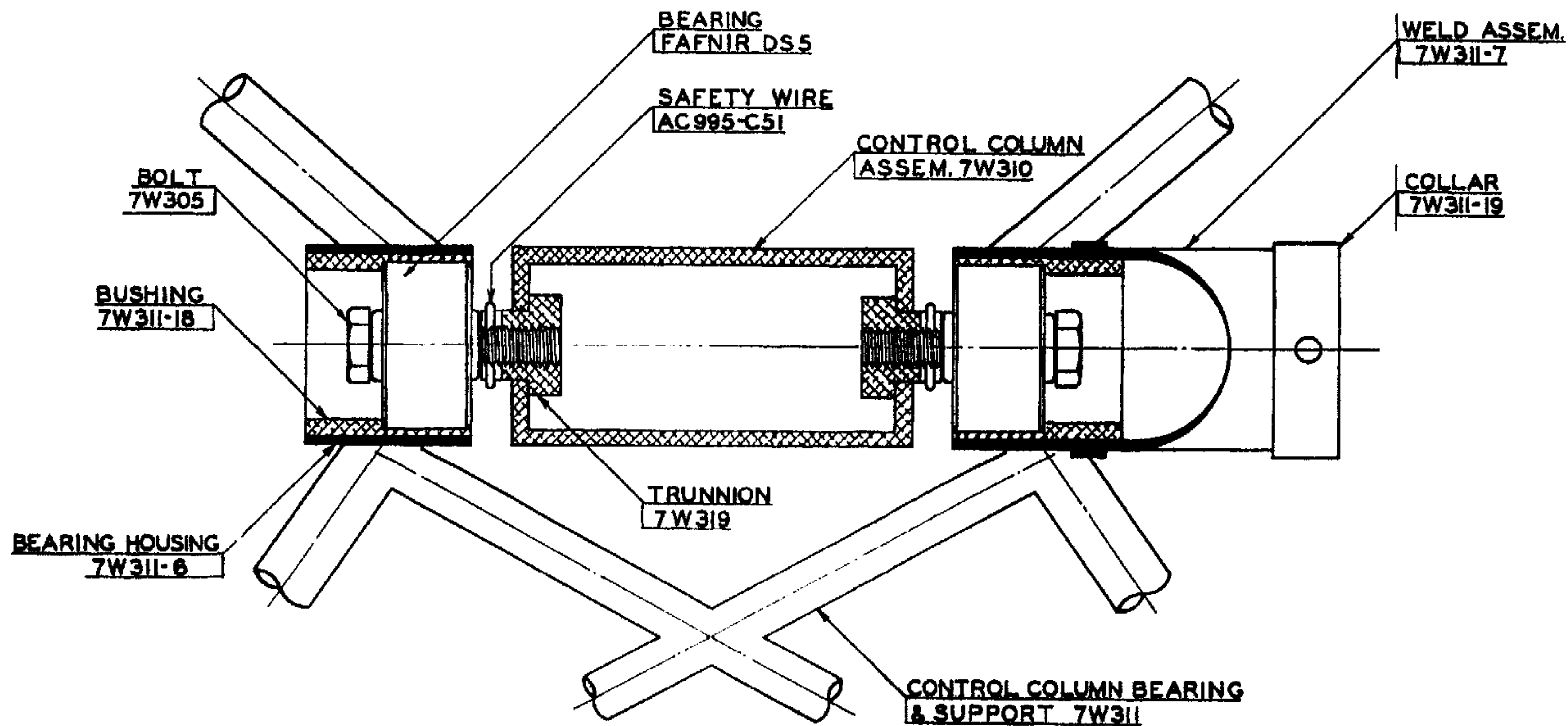
A good protective coating for control cables is a mixture of white lead and tallow. Rub this mixture on the cables.

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CONTROL SYSTEM  
SPARTAN EXECUTIVE

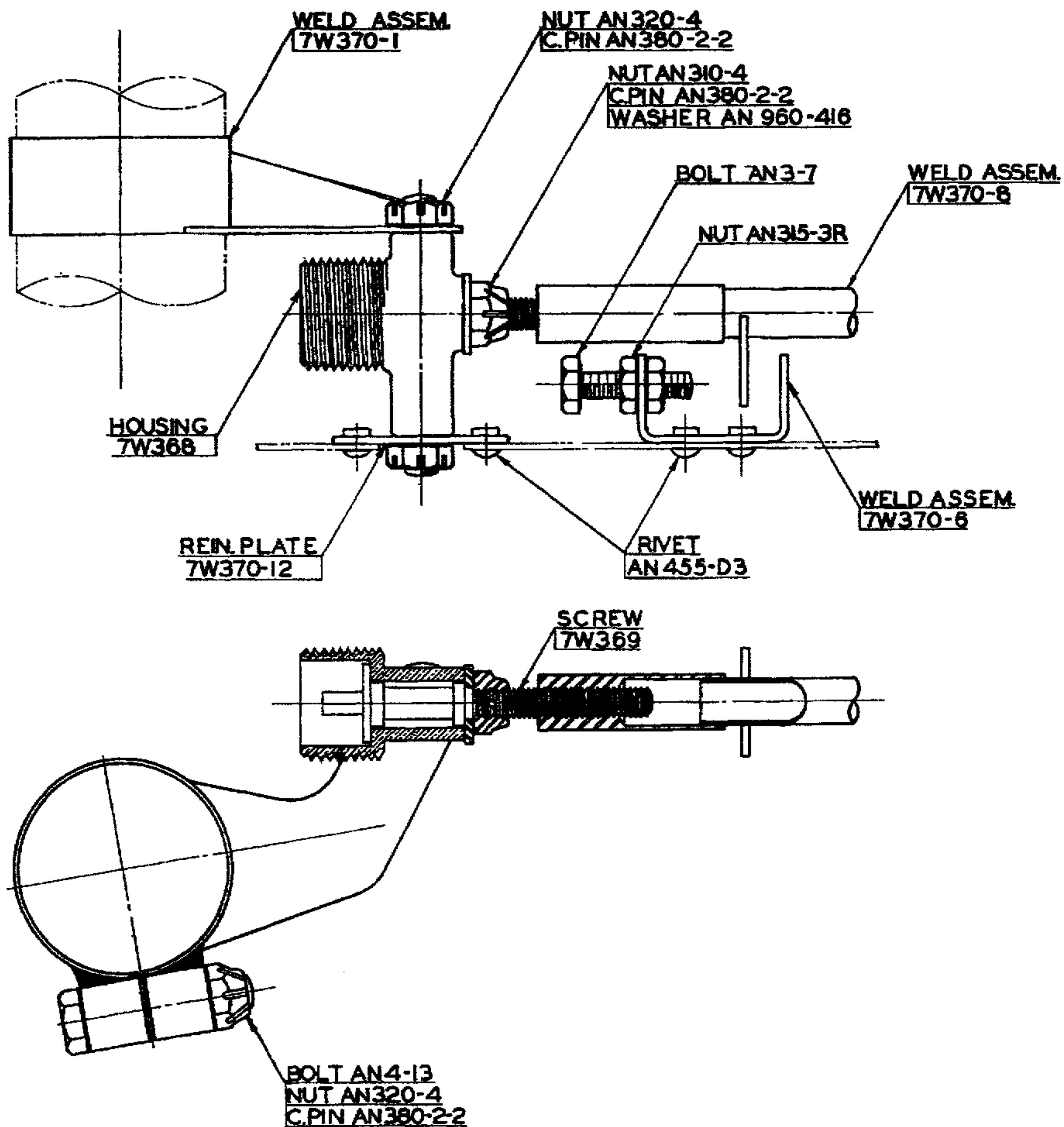
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CROSS SECTION THRU CONTROL COLUMN  
AT POINT OF ATTACHMENT

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TAB DRIVE SCREW MECHANISM IN ELEVATOR



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## SECTION V — LANDING GEAR GROUP

### LANDING GEAR RETRACTING SWITCH

This switch is located on the center-line of the instrument panel and is clearly marked. Throw the switch "up" to retract the gear, and throw it "down" to lower the gear.

NOTE: Do not throw switch until you are absolutely sure that the airplane is clear of the ground and is not apt to settle. Do not attempt to retract gear with speeds in excess of 125 M.P.H. as burned-out fuses will result.

### LANDING GEAR RETRACTING HAND CRANK

For emergency, the Executive has a hand crank which will operate the landing gear in case of failure in the electrical system. This crank is located on the left hand cabin wall in easy reach of the pilot.

To Operate Crank:

- (1) Be sure landing gear operation switch is in the "off" position.
- (2) Pull crank out, towards center of cabin, and rotate to engage.
- (3) Now crank may be turned to operate gear.

NOTE: Do not attempt to operate crank while electric gear is in motion, as the hand crank drives through the retracting motor.

### LANDING GEAR WARNING HORN

An electrically operated warning horn is provided which goes into operation when the throttle is pulled back while the landing gear is in the retracted position. This warns the pilot that he has forgotten to lower his landing gear when approaching the field.

Even though the horn has sufficient volume under normal conditions the pilot should remove his headphones during the landing period.

This horn circuit is shown in the general wiring diagram.

### LANDING GEAR DRIVE EXPLANATION

The landing gear system is synchronous in operation because both wheels are retracted by an integral mechanism. The central power unit, or the motor and mitre gear box assembly, drive each side simultaneously by two torque tubes to the worm gear box at each wheel.

The limit switches on the left gear box and the indicator switches on the right gear box register separately on the instrument panel, thereby giving the pilot correct information on both wheel locations.

The indicator switches on the instrument panel register as follows: The two upper red lights show

that both wheels are retracted. The two lower green lights show that both wheels are down. The center amber light is always on when the retracting motor is running.

For a visual inspection of the landing gear wheel positions the pilot can open the front ventilator on the floor and look through the wheel well windows which are provided for this purpose.

### LANDING GEAR RETRACTING MOTOR

Power for the landing gear retracting mechanism is furnished by the Eclipse Y-150 electric motor. The motor contains a solenoid operated disc type clutch which has been pre-set so that the clutch will slip before any damage might occur to the system. For further protection, a 30 ampere fuse is placed in the circuit and it will blow out in case a load just slightly more than the clutch setting is imposed. This means that if for any reason the clutch should stick, the fuse would fail before the motor could deliver an excess load to the retracting mechanism. In such cases the hand crank is used until the trouble is corrected.

### LANDING GEAR WORM GEAR BOXES

This gear box, being driven by the mitre gear box through the torque tube, operates the crank that actuates the landing gear. The crank is directly connected to the top of the shock strut assembly by a large link tube.

Practically no maintenance is required on the worm gear box other than routine inspection and lubrication. These boxes are packed with graphite grease and it is recommended that a small amount of SAE number 10 oil be added every 50 hours to soften the grease.

### MITRE GEAR BOX AT RETRACTING MOTOR

This gear box is mounted integral with the retracting motor. The driving torque tubes go from it to the worm gear boxes.

Routine inspection and lubrication should be all that it requires. Pack every 100 hours with rocker arm grease.

### TIRES—MAIN LANDING GEAR

The main landing gear has 8.50 x 10 heavy duty Goodyear tires and Goodyear puncture seal tubes.

The recommended tire pressure is 26 pounds.

### TO REMOVE A TIRE

- (1) Place jack under axle on landing gear fork and raise until tire is free.
- (2) Remove wheel cover disc plate.
- (3) Remove cotter and nut on axle.
- (4) Remove wheel.

- (5) Be sure tire is fully deflated.
- (6) Loosen beads from bead seats on rims.
- (7) Force outside bead from bead seat into rim well at a point opposite valve.
- (8) Be sure bead is in well, and then with two tire tools placed approximately 4 inches on each side of the valve, lift the bead over the rim flange.
- (9) Follow around with tools until bead is free.
- (10) Remove inner tube.
- (11) Force remaining bead from wheel.
- (12) After repairing, dust inner tube and inside of casing with powdered soap stone and rub ordinary soap into the bead of casing before mounting.

#### TO MOUNT A TIRE

- (1) Force inside bead over rim.
- (2) Partially inflate tube and insert.

NOTE: All tires have red balance dots. All later type of puncture proof tubes have a balancing mark on the heavy portion of the tube. (Mark is approximately 1/2 in.x2 in.)

- (3) Balance mark on tire and tube must coincide. (If tube is old style, locate valve at balance mark on tire.)
- (4) Force remaining bead over outside rim.
- (5) After making sure proper installation of the tube has been effected, inflate to 26 pounds.
- (6) When re-mounting wheel to axle, be sure that brake discs are in proper alignment during the procedure.

#### SHOCK STRUT MAINTENANCE

##### (A) Main Landing Gear Shock Struts.

To fill:

- (1) Fill all fuel tanks to full capacity.
- (2) Have airplane in three point position.
- (3) Entirely deflate shock struts.
- (4) Remove filler plug and fill to its level with Delco Shock absorbing fluid.
- (5) Replace plug.
- (6) Pump up struts with air until within approximately 2 1/2 inches of the full travel of the strut up-stroke.
- (7) Replace valve cover.

##### (B) Tail Wheel Shock Strut.

To fill:

- (1) Fill all fuel tanks to full capacity.
- (2) Have airplane in three point position.
- (3) Entirely deflate shock strut.

- (4) Remove filler plug (through inspection door under stabilizer) and fill to its level with Delco Shock absorbing fluid.
- (5) Replace plug.
- (6) Pump up strut until fairing cup is flush (or in line) with bottom fuselage skin.
- (7) Replace valve cover.

NOTE: A regulation shock strut pump should be used.

#### BRAKE SYSTEM

The Executive can be furnished with either the toe or heel brake installation. Because most customers prefer the toe brakes, they are dealt with only in this book. Information and drawings on the heel brake installation will be furnished any owner upon request.

The brake system is hydraulic, having two master cylinders actuated by the brake pedals. One reserve tank located on the firewall serves both of these cylinders.

At the time the airplane is delivered, the braking system should be good for a great number of normal landings. This condition obviously alters when continued severe usage or unusual service is demanded of the system.

#### GENERAL MAINTENANCE

##### (1) Brake fluid.

Use only Univis number 40 mineral oil. This fluid may be obtained from any Standard oil bulk station, or branch, or service hangar.

##### (2) Reserve tank.

- (a) Operating level is half full.
- (b) Keep vent in plug open.

##### (3) Bleeding the System (gravity feed).

- (a) Fill reserve tank with Univis number 40 oil.
- (b) Remove cap screw from bleeder plug at wheel and insert hose. Place free end of hose in a clean glass receptacle.

NOTE: The free end of the hose must be under the fluid in the receptacle at all times to be able to check on escaping air bubbles.

- (c) Back off bleeder plug and permit system to fill by gravity from reserve tank. This will require a few minutes.

- (d) When the fluid starts to flow from the bleeder hose, apply the brake pedal rapidly and force fluid through hose into receptacle. Hold brake on and turn bleeder plug tight. Then allow pedal to return slowly to full-off position. This draws new fluid into system from reserve tank.



- (e) Next, open bleeder plug and push brake pedal on rapidly again. Tighten bleeder plug before allowing brake pedal to return slowly to brake-off position.
- (f) Repeat this operation until no more air bubbles come from the bleeder hose. System is then properly bled and hose should be removed. Replace the bleeder plug cap screw and washer.

#### (4) Adjusting Brakes at Wheel.

As the rotating bronze discs in the brake wear, remove the wheel from the brake unit and take up on the brake disc adjustment and lock nut.

Proceed as follows:

- (a) Remove wheel and remove safety cotter that anchors disc retaining and adjustment nut.
- (b) Screw the disc retaining and adjustment nut up tight, then back off until a .030 inch feeler gauge can be inserted between the discs. (This means for the entire set—not each disc.)
- (c) Set to nearest locking position, (six are provided) being sure to have no less than .020 inch for entire set of discs, and replace cotter pin.

If discs are sufficiently worn, they should be replaced.

Replace in the following manner:

- (a) Remove wheel and safety cotter for disc retaining and adjustment nut.
- (b) Remove disc retaining and adjustment nut.
- (c) Slide discs off the brake assembly and replace with new ones.
- (d) When re-mounting wheel on the brake unit, the keys extending from the bronze discs should all be lined up with a straight edge, and the parking lever applied to hold them in that position.

### MAINTENANCE HINTS ON HYDRAULIC BRAKES

#### (1) Excessive pedal travel.

Probable cause:

- (a) Normal wear of bronze discs at wheel.
- (b) Improper adjustment of discs.
- (c) Leak in system.
- (d) Air in system.
- (e) Lack of fluid in tank.
- (f) Vent in tank stopped up.
- (g) Improper bleeding—air mixed with fluid.

Remedy:

- (a) Take up wear on discs. If discs are worn too thin, replace with new ones.
- (b) Adjust for .030 inch clearance.
- (c) If pedal will go clear on under pressure, there is a fluid leak in the system. Check out the leak. If piston seal at the wheel is worn or shrunk, replace with Goodyear Seal 95-0118.
- (d) A springy, rubbery action of the pedal indicates air in the system. An excessive amount of air in the system will permit the pedal to go full on under normal pressure. In either case the system should be bled.
- (e) Air will enter the system if tank runs dry. Tank supply should be checked at regular intervals and kept at least one half full.
- (f) If vent in tank becomes stopped, there is a possibility of creating a vacuum in the supply tank so that fluid would not feed back into the system by gravity. As a result, the lack of fluid in the system might permit excessive or full pedal travel without resultant brake operation.

#### (2) Dragging Brakes.

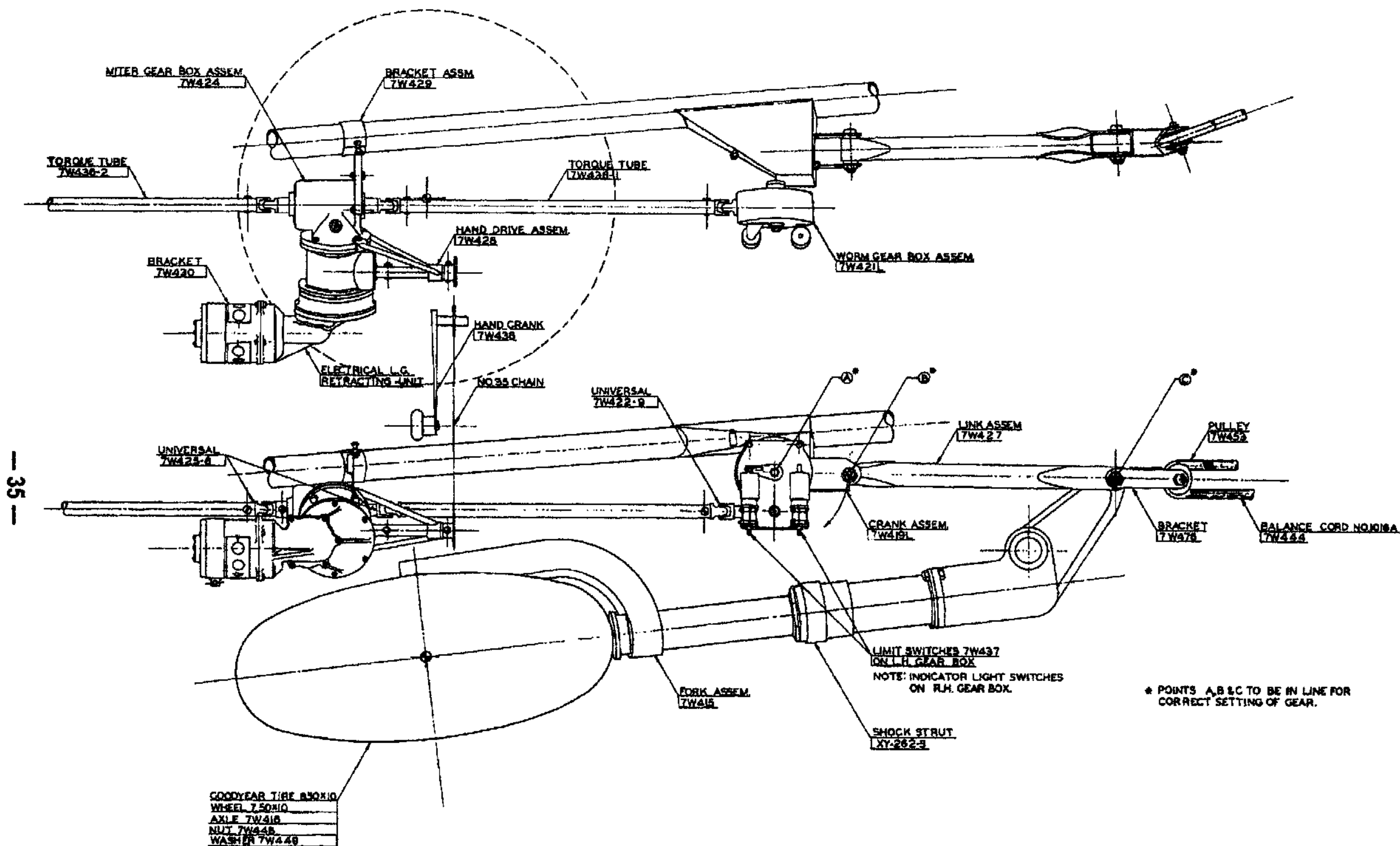
Probable cause:

- (a) Improper adjustment of discs.
- (b) Dirt in system.
- (c) Binding of brake piston or dust shield.
- (d) Use of improper fluid.
- (e) Weak or broken brake piston return springs.
- (f) Weak or broken master cylinder piston return spring.
- (g) Dished or warped bronze or steel discs.

Remedy:

- (a) If discs are adjusted to provide for less clearance than recommended, expansion due to heat resulting from operation may cause dragging or even locked brakes.
- (b) If dirt is found in the system, the master cylinders and brake assemblies must be dismantled and parts cleaned with alcohol. After this operation, flush tank and lines with Univis number 40 fluid. Fluid used for flushing should either be thrown away or carefully strained.
- (c) Dust and dirt mixing with brake fluid at the brake piston may become gummy and cause sticking of the brake piston or even air leaks. Parts should be removed and cleaned with alcohol.

- (d) Improper fluid may cause failure to operate under severe heat or cold conditions, may destroy rubber seals, and may cause swelling of the seals (which will close compensating port). If such is the case, replace seals, (be sure they are synthetic), flush system with alcohol and refill with Unis number 40 oil.
- (e) Weak or broken piston return springs may cause the piston not to return to full-off position or movement would be slower than proper. Locked or dragging brakes may result. Replace with new springs.
- (f) Weak or broken master cylinder springs may cause the piston not to move back against the piston stop and the compensating port would not be cleared. Remove and replace with new springs.
- (g) Dished or warped discs seldom occur. Should this condition exist, remove them and tap them on a surface plate until they return to the flat condition. If they are beyond this treatment, they must be replaced. Dished or warped discs would change the clearance or adjustment, causing dragging brakes.



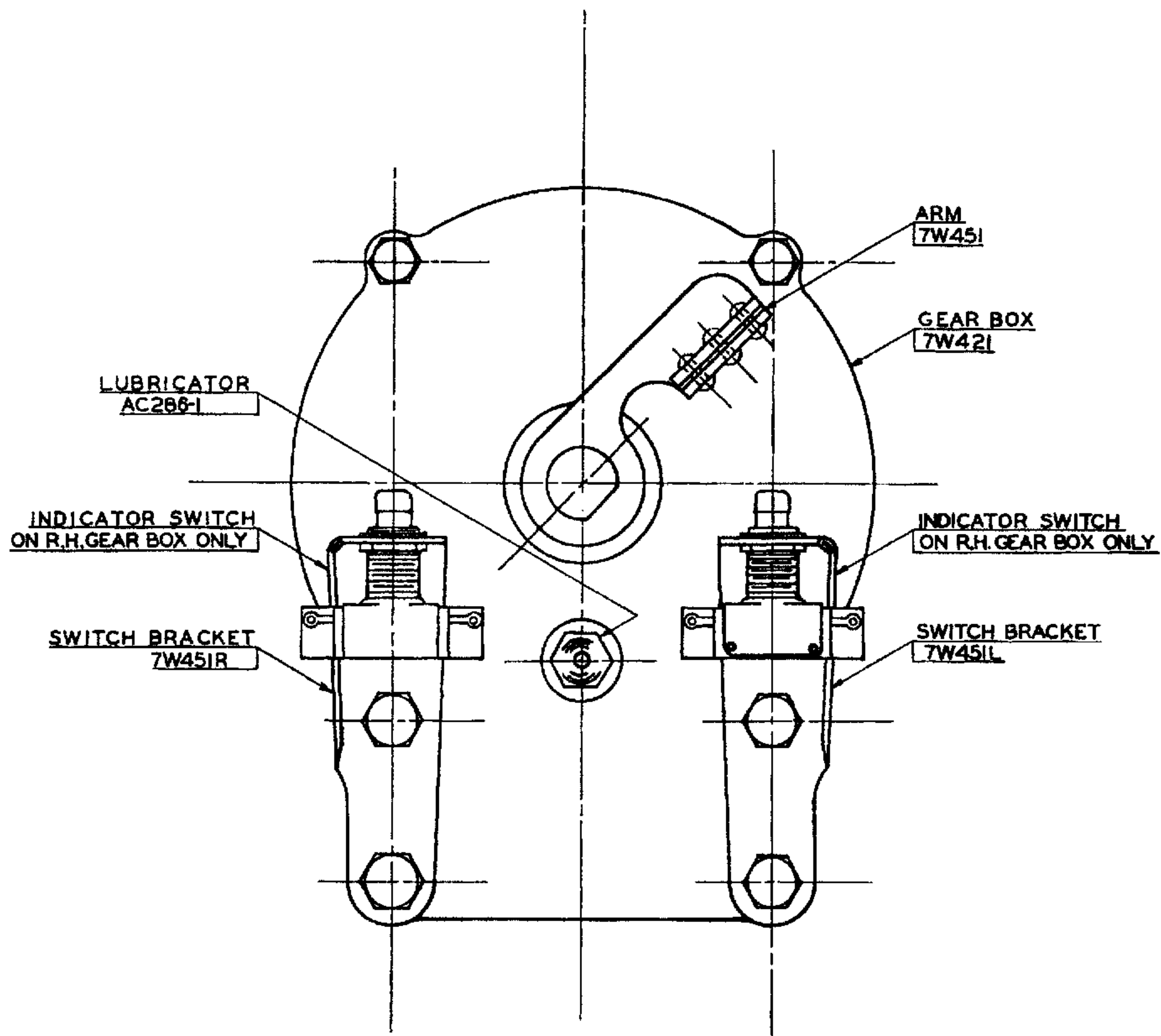
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## LANDING GEAR INSTALLATION

SPARTAN EXECUTIVE

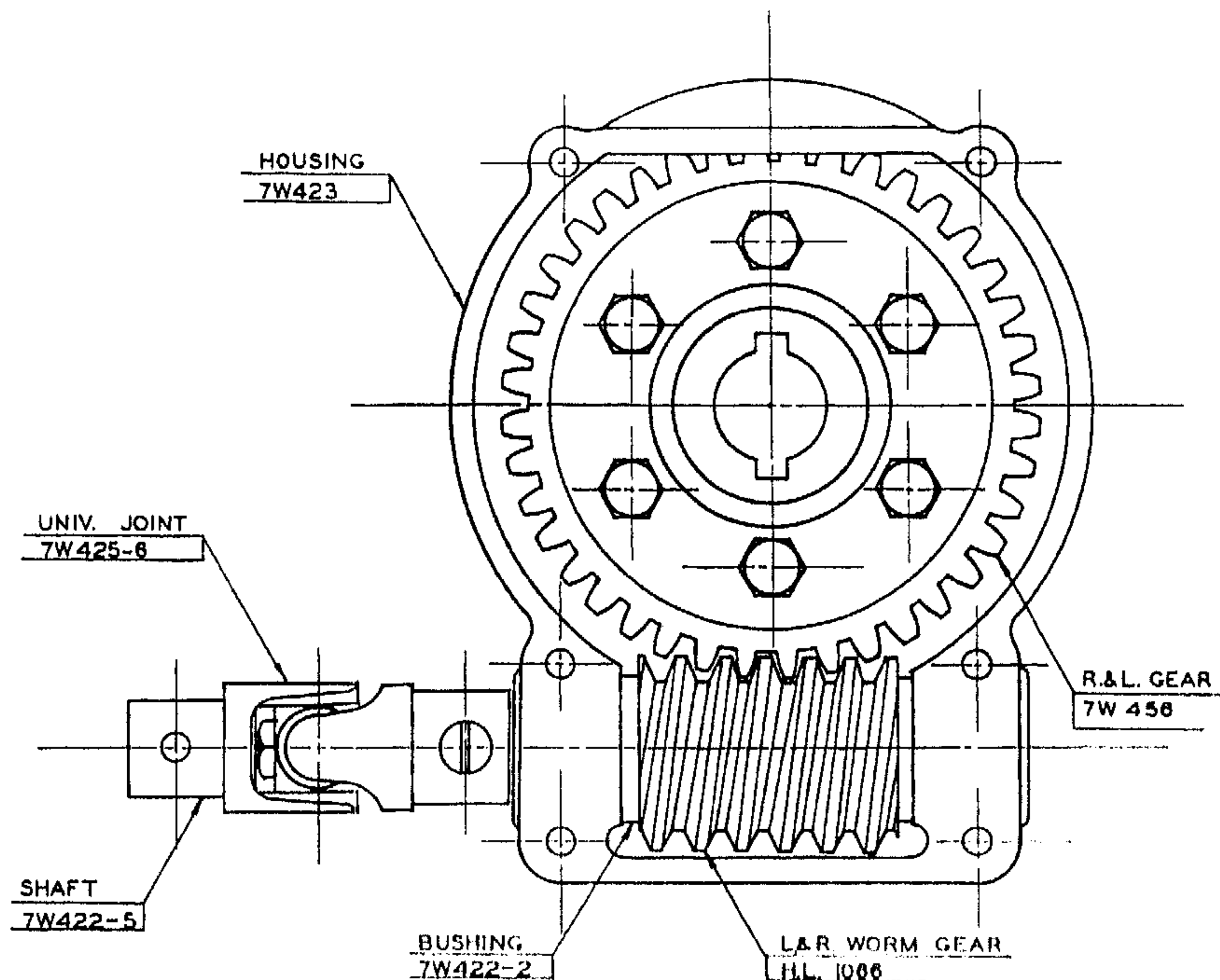
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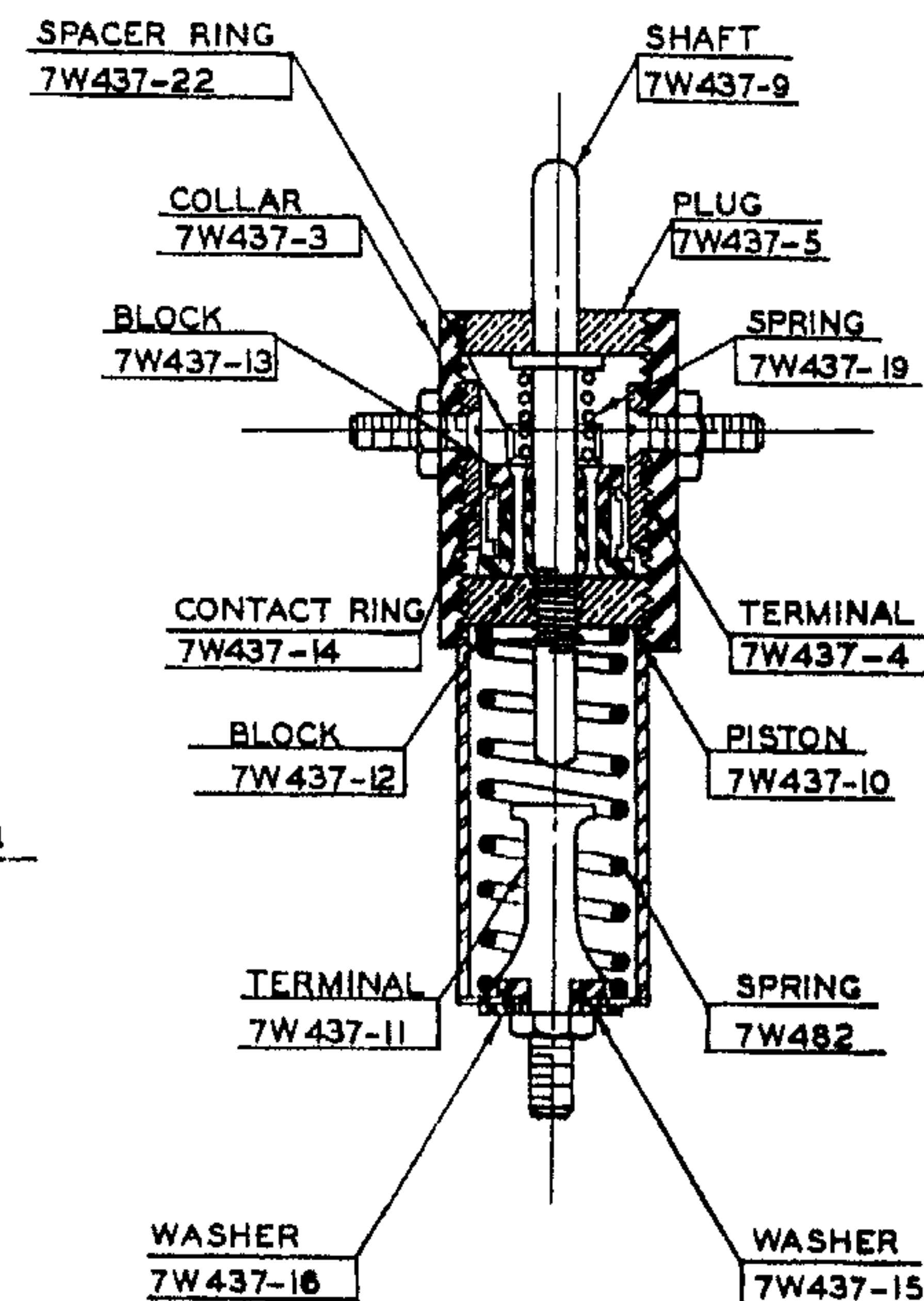


RIGHT HAND L.G. WORM GEAR BOX

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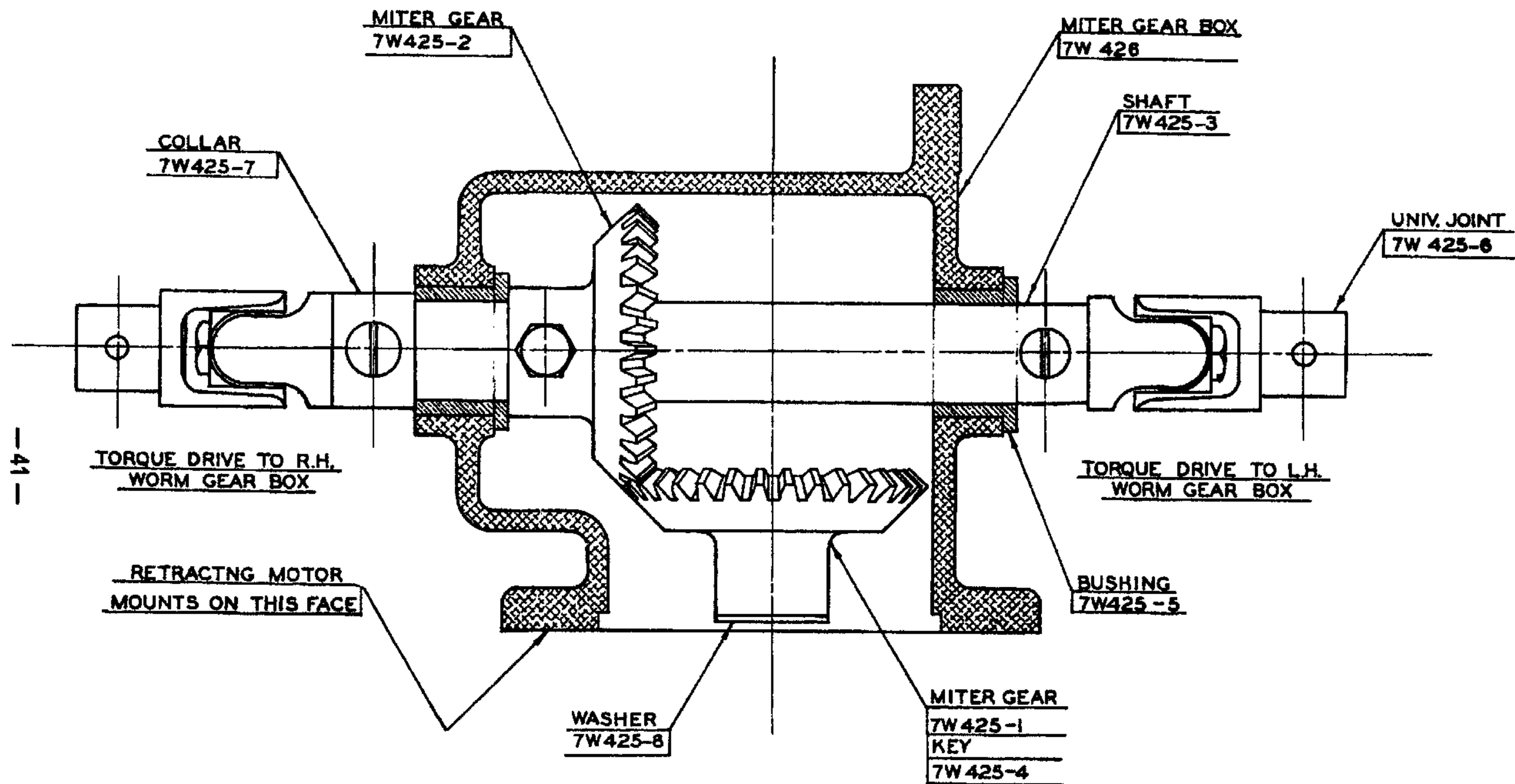
L.G. WORM GEAR BOX  
(WITH COVER REMOVED)



CROSS SECTION THROUGH  
L.G. LIMIT SWITCH  
USED ON LEFT HAND GEAR BOX  
ONLY

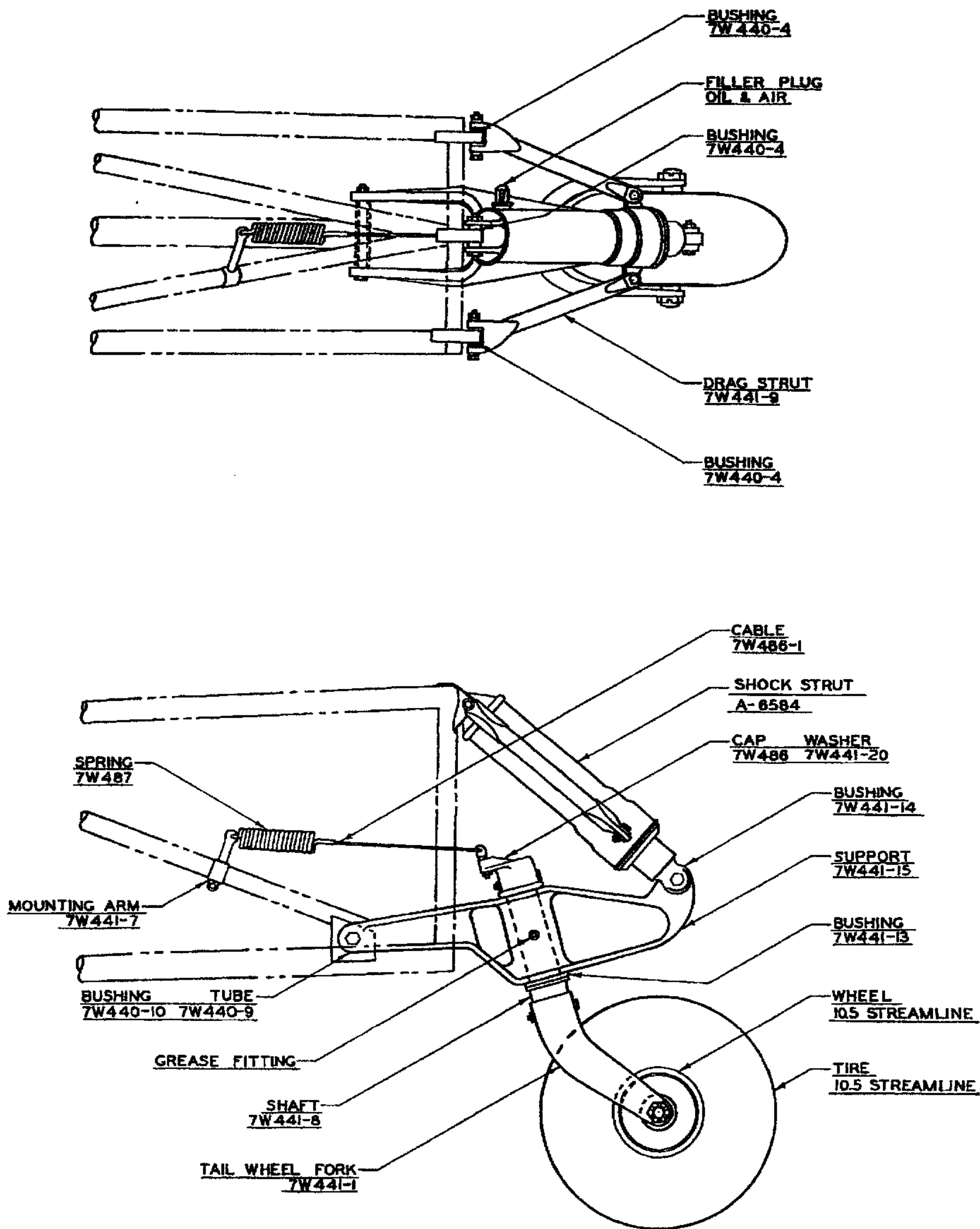
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SECTION THRU LANDING GEAR  
MITER GEAR BOX

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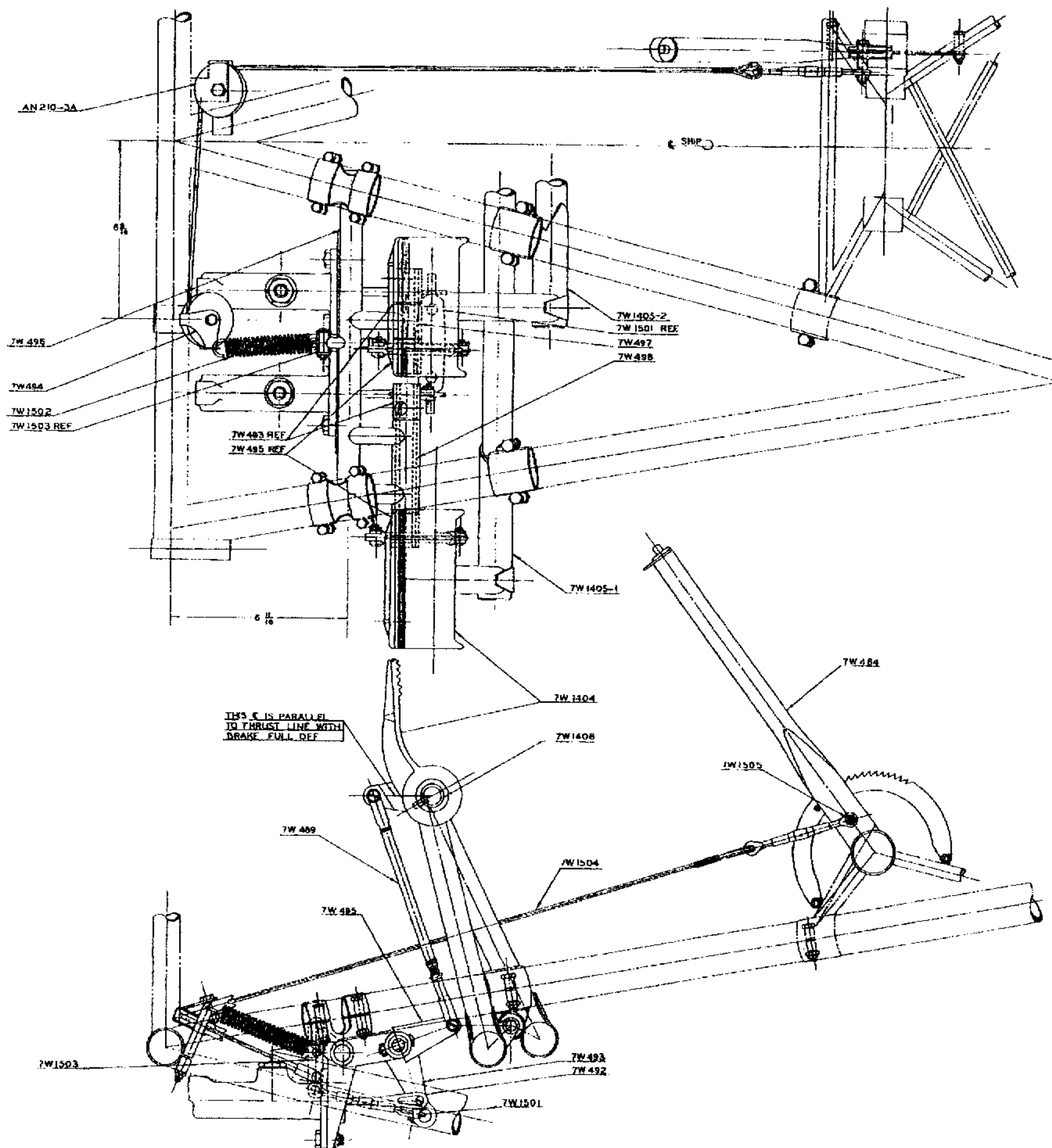


## TAIL WHEEL INSTALLATION

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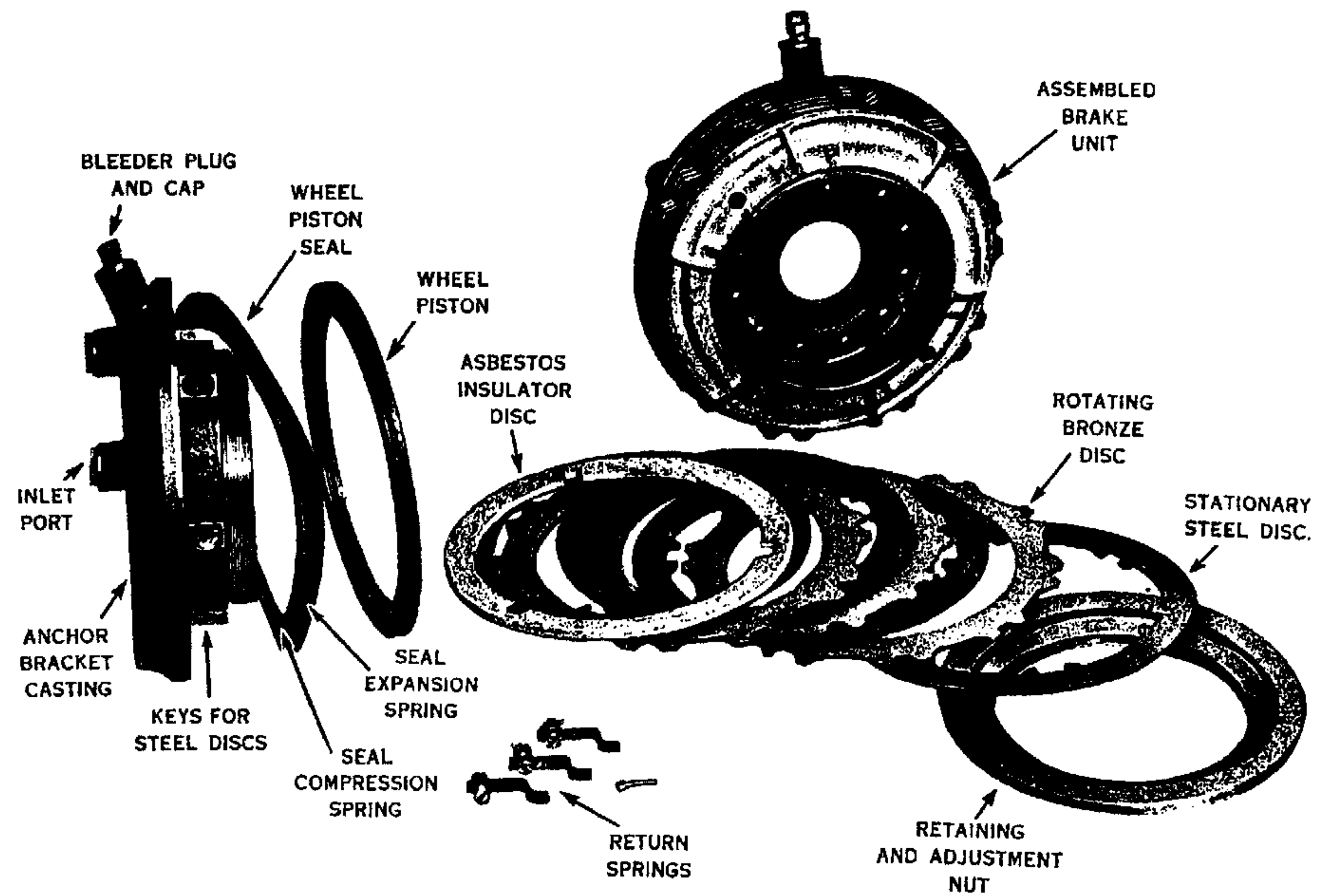


## TOE BRAKE INSTALLATION

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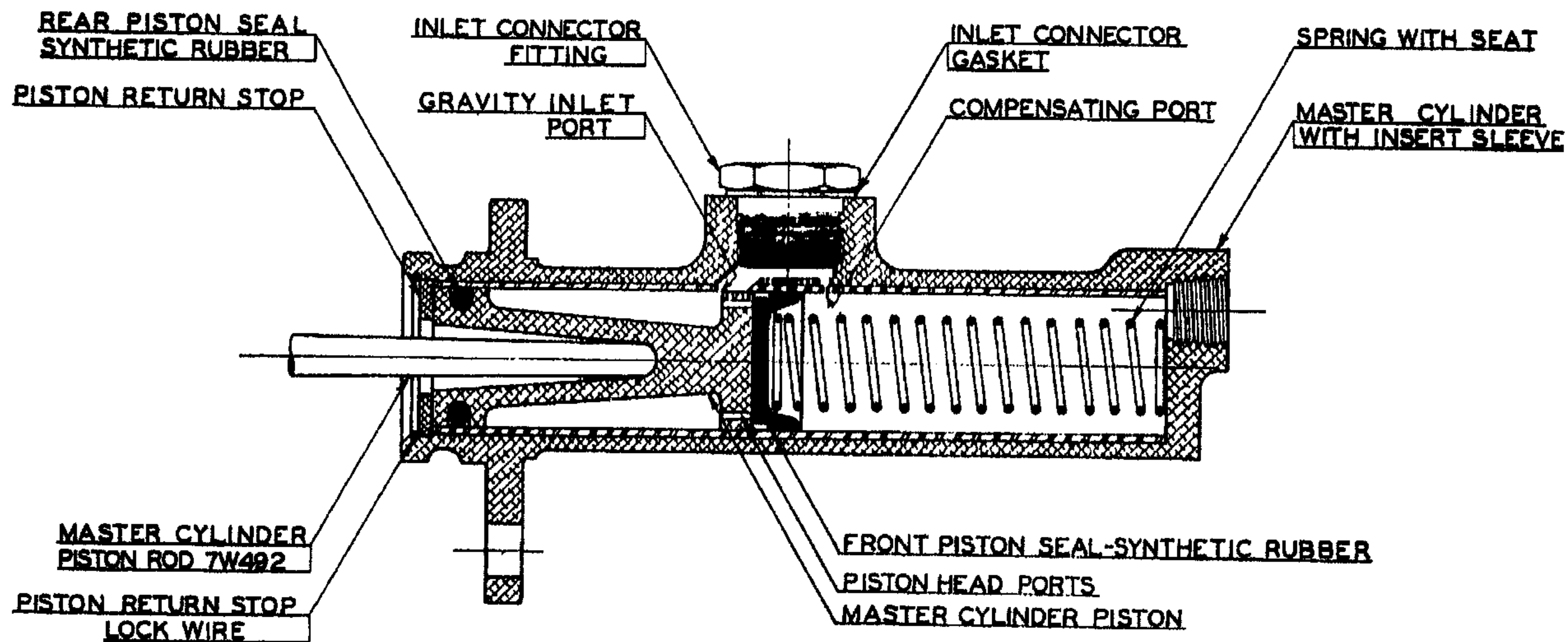
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# GOODYEAR HYDRAULIC DISC TYPE BRAKE 7.50-10 INTERMEDIATE SIZE



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SECTION THRU MASTER BRAKE CYLINDER

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## SECTION VI — BODY GROUP

### FUSELAGE STRUCTURE

The fuselage structure, like the wing, is composed of a basic steel tubing truss, aluminum alloy bulkheads, stringers and external skin. The chrome-molybdenum (X-4130) steel tubing used in the basic structure is heat treated to 125,000 pounds per square inch tensile strength. To this structure are attached the bulkheads, landing gear chassis, tail wheel, seat supports, controls, engine and other important units of the airplane. The stringers are of the channel type running lengthwise of the airplane and are continuous through the bulkheads. The bulkheads are mostly of the channel type except at the cabin section where heavy "H" sections are used. The cabin door is between these sections. The wing stub structure is an integral part of the fuselage structure.

As noted above, the basic steel tubing structure is chrome-molybdenum (X-4130) steel heat treated to 125,000 pounds per square inch.

**CAUTION!** Before attempting to repair or weld any part of this structure the Spartan Aircraft Company should be consulted. Never weld or apply heat to the middle section of any tube or attempt any "sleeve" repair installations without consulting the factory.

The bulkheads, stringers, and skin covering are fabricated from 24ST Alclad aluminum alloy.

All rivets are 17ST.

The firewall is stainless steel.

### PRESSURE FIRE EXTINGUISHER

The carbon-dioxide pressure extinguisher is the well known Lux system, model 36-I.

### OPERATION

#### 1. Before flight.

- (a) Inspect indicator window in valve and make sure it shows clear. If cross on indicator is visible, remove cylinder, have charged, and replace immediately.
- (b) Check safety disc indicator. This consists of a red celluloid disc located in a fitting on the lower front face of firewall. If indicator is not intact, the cylinder has been prematurely discharged due to high temperature and must be recharged immediately.

#### 2. After System has been operated.

- (a) Remove empty cylinder and have it recharged immediately. (See instructions given under "Maintenance.")

- (b) Reset the control handle and cable. Work the cable back and forth a few times to make sure it doesn't bind.
- (c) Inspect the perforations in distributing tubing (around engine mount ring and carburetor) to see if any are clogged. Also remove the tube plug at end of tubing and remove any dirt or other foreign matter. Replace plug.
- (d) Re-install the recharged cylinder. (See instructions under "Maintenance.")

### MAINTENANCE

The pressure fire extinguishing system requires no more than ordinary care to insure its proper operation. Frequent inspections should be made in order to be sure that the system is constantly in operating condition.

It is recommended that the system be tested every four months. The test should be conducted at a temperature of approximately 70° F.

To test the system, proceed as follows:

- (1) If possible, the test should be made with the airplane in flying position.
- (2) Hook an ordinary spring balance scale over the pull handle and pull with a slow, uniform pull until the system is operated. The force required should not exceed 50 pounds.
- (3) Remove the discharged cylinder and have it recharged and replace immediately. To remove the cylinder, proceed as follows:
  - (a) Remove the cover plate, remove the cotter pin, and disconnect the control cable from the long lever.
  - (b) Disconnect the control cable tubing from the cable outlet.
  - (c) Disconnect the gas tubing from gas outlet. Remove tubing sleeve only.
  - (d) Disconnect safety discharge line by placing wrenches on the large hex and the special sleeve at valve.
  - (e) Remove bolt from clamp on neck of cylinder and remove cylinder.
  - (f) Have cylinder recharged to its full capacity. (See instructions under "Recharging.")

**NOTE:** The cylinder may be recharged by any manufacturer of carbon-dioxide or at any Lux dealer. It may also be recharged from a commercial 50-pound carbon-dioxide cylinder by means of the "by-pass" method or by the Lux transfer unit.

- (g) Re-install fully charged cylinder.
- (h) Make certain that the proper data has been entered on the record card which is stored in the slot under the name-plate on the valve.

NOTE: If system is not discharged periodically every four months as described above, remove and weigh the cylinder at least every six months. If, when weighing the cylinder, it is found that the gas charge is less than the amount specified by four ounces or more, the cylinder must be recharged. See weights stamped on the valve body. Record the required data on record card.

## RECHARGING

In order to recharge the cylinder, the cover is removed from the valve and a wrench applied to the valve stem. The valve stem is rotated counter-clockwise (Exactly as opening any standard valve prior to recharging). This causes the valve stem shoulder to press against the stop washer and axial thrust is exerted on the lead screw which recedes to its normal position. The short lever is returned to its normal position by the short lever spring and the indicator cross disappears from the window. The gas may now be introduced through the valve outlet and the cylinder filled to rated capacity, and the valve closed by turning valve stem clockwise, tightening securely. All necessary information should be entered on the record card and the cover replaced on the valve.

## HAND FIRE EXTINGUISHER

This extinguisher is the Pyrene 1 quart type.

The hand fire extinguisher should be partially discharged and refilled at least once per year. A record of the recharging date should be kept. When recharging, only genuine Pyrene fire extinguisher fluid should be used. Water or other substitutes will damage extinguisher and render use on electrical fires dangerous.

## Flares

### GENERAL INFORMATION

The Deluxe Model Executive is equipped with 4 electrically operated flares rated at 1½ minutes each. Any maintenance on these flares or flare circuits must be done with **extreme caution**.

The flare switch assembly consists of 5 toggle switches having individual safety locks. The right hand switch is the master switch which must be thrown before the circuit can be completed to individual flare switches. The safety locks are provided to prevent inadvertent closing of a flare circuit, and a switch can be thrown only when its lock lever has been moved out of engagement.

The flares are released by the burning out of a small resistance wire by the passage of an electric current through the ignitor. To release a flare, first unlock and throw the master switch to "on." Next, unlock and throw an individual flare switch to "on." It is not necessary to return an individual flare switch to "off" after releasing a flare. Subsequent flares can be released by merely unlocking and throwing their respective switches.

These flares can be used to a good advantage up to 1,200 feet. The average descent during the period of burning is 600-700 feet.

NOTE: As soon as a landing has been effected the master switch should be thrown to the "off" position in order to render inoperative the flares that have not been released.

## MAINTENANCE OF FLARES

- (1) The only maintenance or periodic inspection necessary is an occasional test of the flare circuits to insure tight connections and that circuits are in working order.
  - (a) **Always remove the flares from the rack before testing the circuit**, as the resistance in the test lamp would not be sufficient to prevent release of the flare if accidental contact should be made with the flare.
  - (b) Never attempt to repair or test a circuit, or remove the flare switch from its mounting, without **first removing all flares from the rack**.
  - (c) Testing the circuit of a flare. **Remove all flares from rack.** A small test lamp can be successively inserted in the individual flare circuits in place of the flare. This lamp should light when the switch for that flare is thrown to the "on" position after throwing the master switch to "on." After testing, make certain all switches are in the "off" position, and locked with their respective levers.
  - (d) **Never attempt to solder at the flare terminals.** Use soldering lugs instead.
  - (e) If it is ever necessary to paint the closing caps of the flare tube to match the airplane, **do not dip in paint or lacquer**, but merely paint the top surface of the cap only.

## GENERAL CARE OF INSTRUMENTS

- (1) Lines running to the Gyro-Horizon, Directional-Gyro, vacuum gauges, Sensitive Altimeter, and Air Speed Indicator should be blown out periodically. To do this, disconnect lines at instruments and at all terminals and apply air pressure backwards through lines.

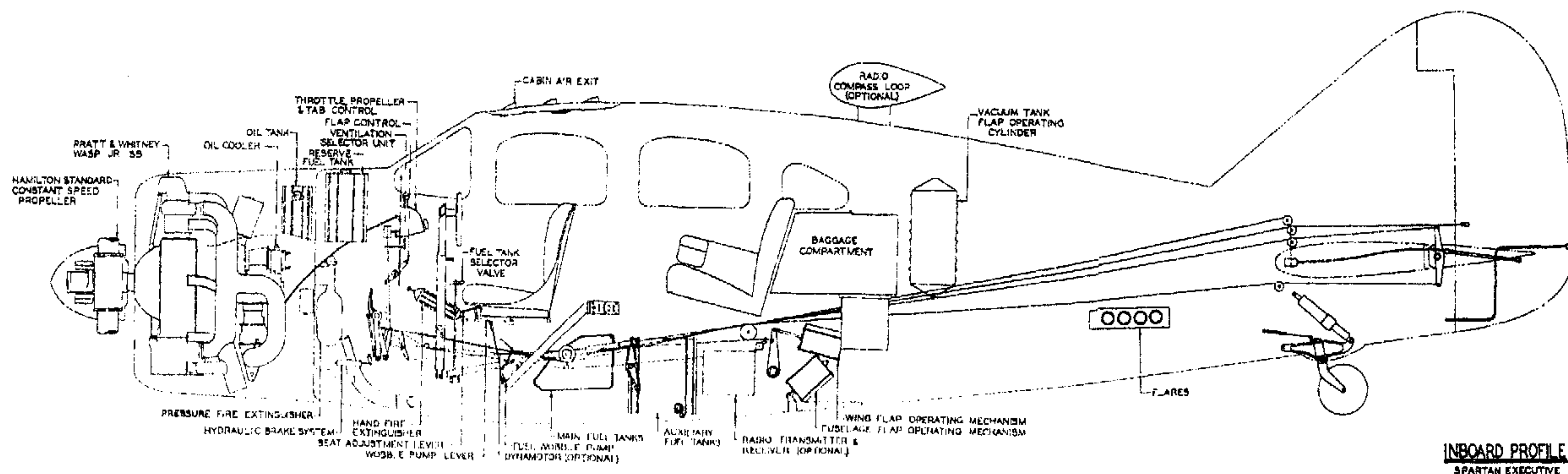


- (2) Filters on the backs of the Gyro-Horizon and Directional Gyro should be changed as often as flying operations necessitate.
- (3) Most maintenance in the Aero Mixture Indicator (Cambridge) is the necessity of keeping the wick in the vapor plug damp, keeping the breather hole in the plug open, changing the steel wool in the filter chamber, and setting the mechanical and electrical "zero." For care of this instrument consult the manual which comes with it.

Spartan Aircraft Company furnishes this manual with airplanes having the instrument.

- (4) The vacuum gauges have sealed cases. Should the seal become broken, or the glass broken, the instrument will not function.
- (5) Aerobatic flying will damage the gyro instruments.
- (6) Keep all wire terminals and tubing fittings tight.

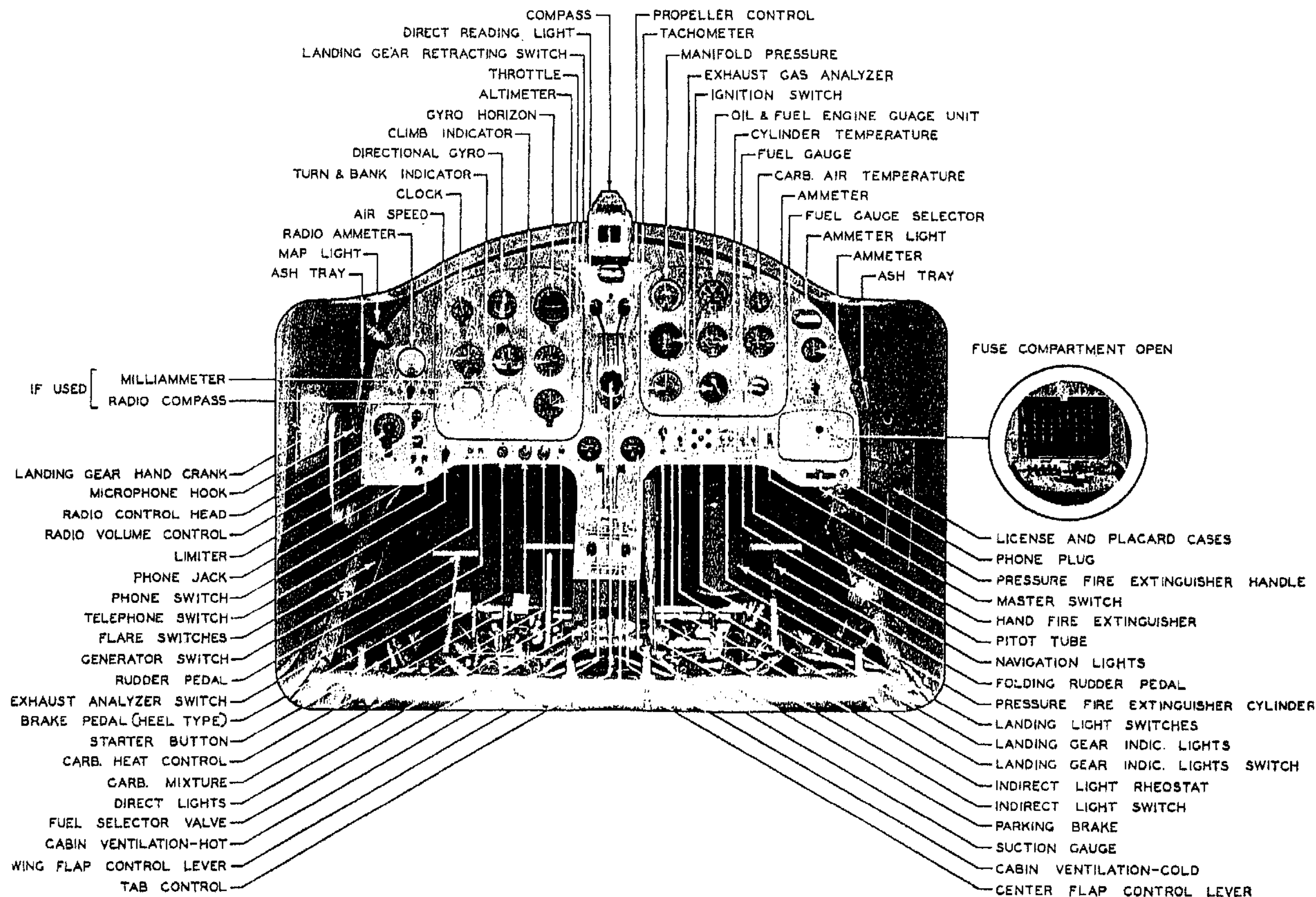
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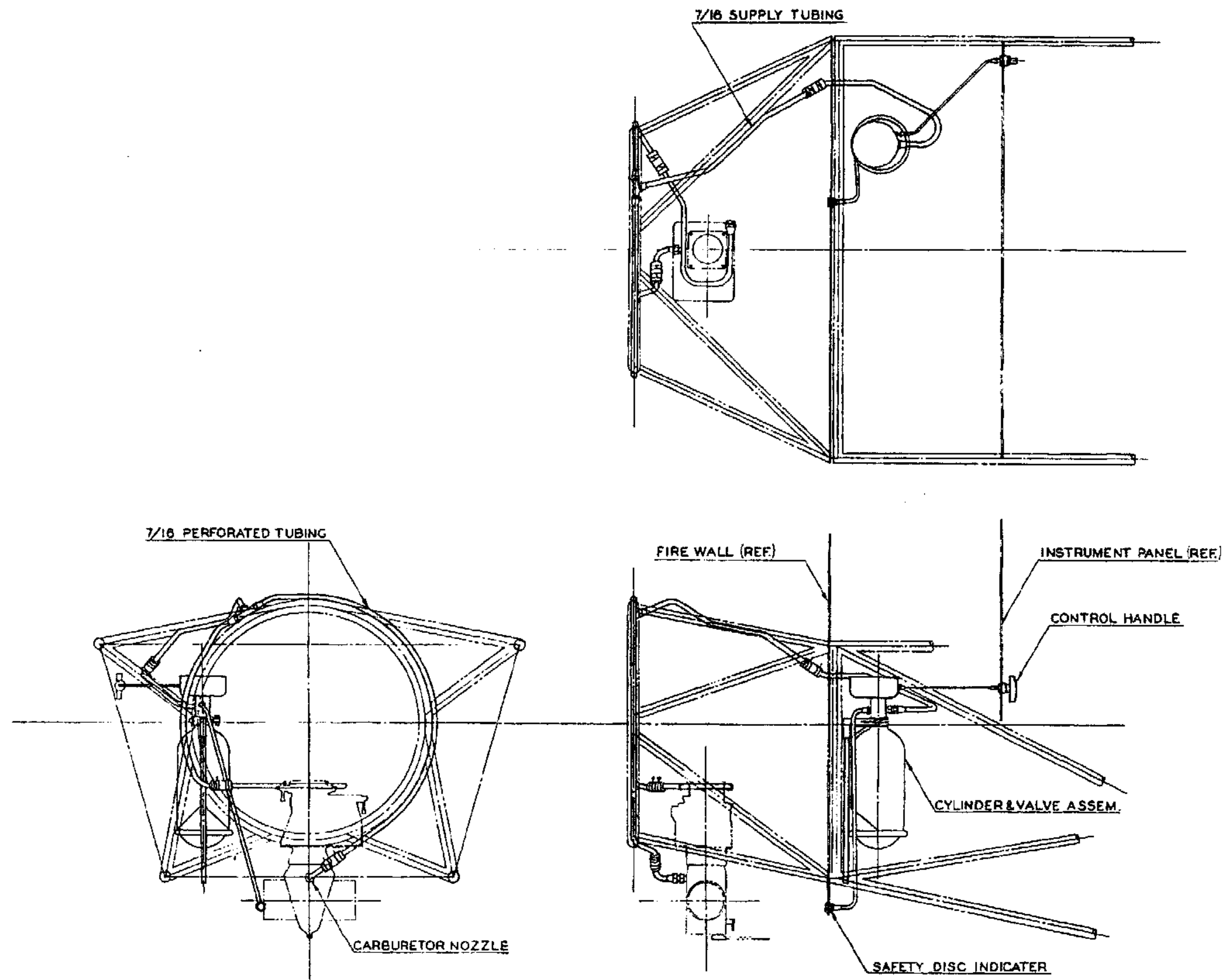
**INBOARD PROFILE**  
SPARTAN EXECUTIVE

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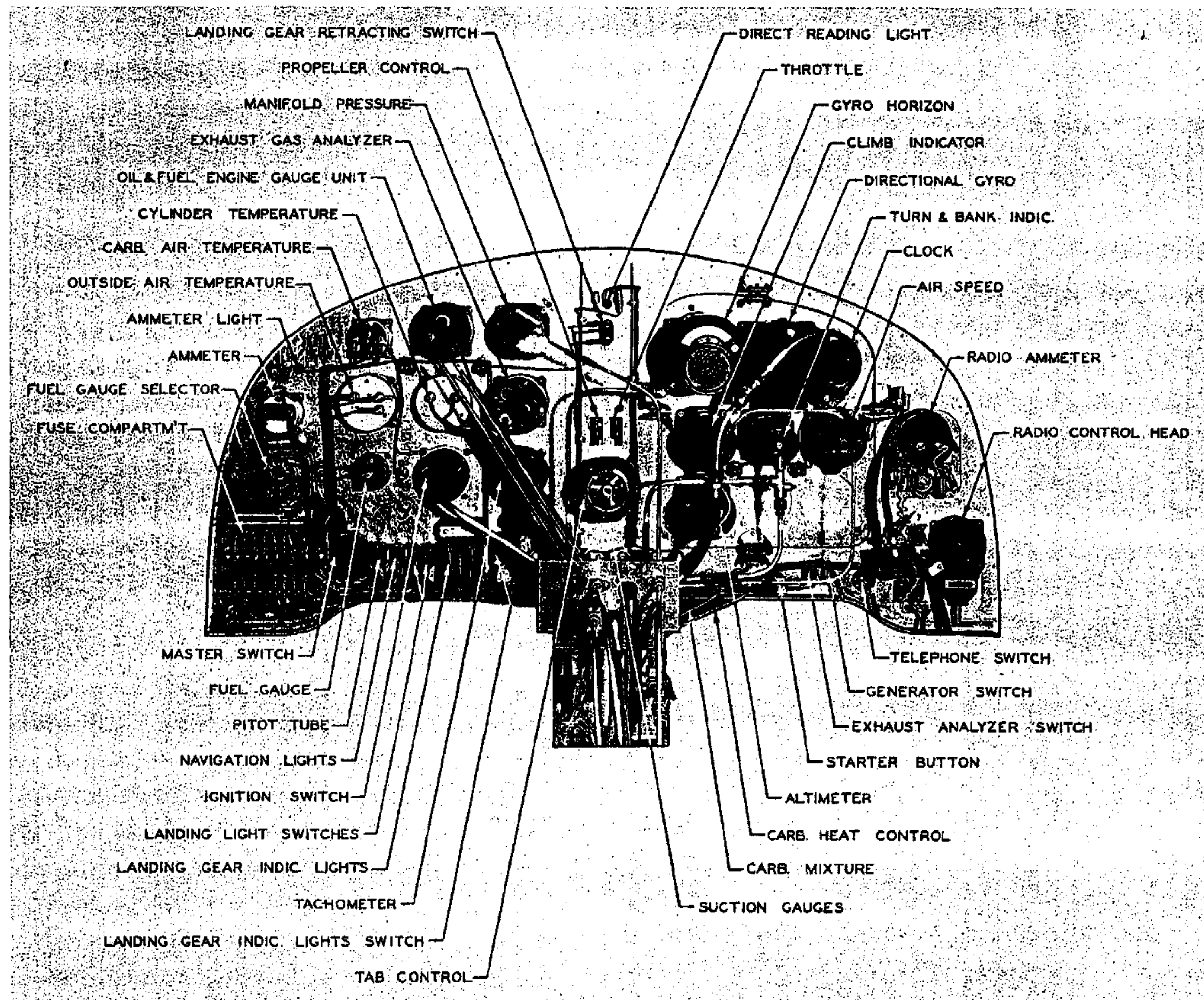
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FIRE EXTINGUISHER INSTALLATION  
SPARTAN EXECUTIVE

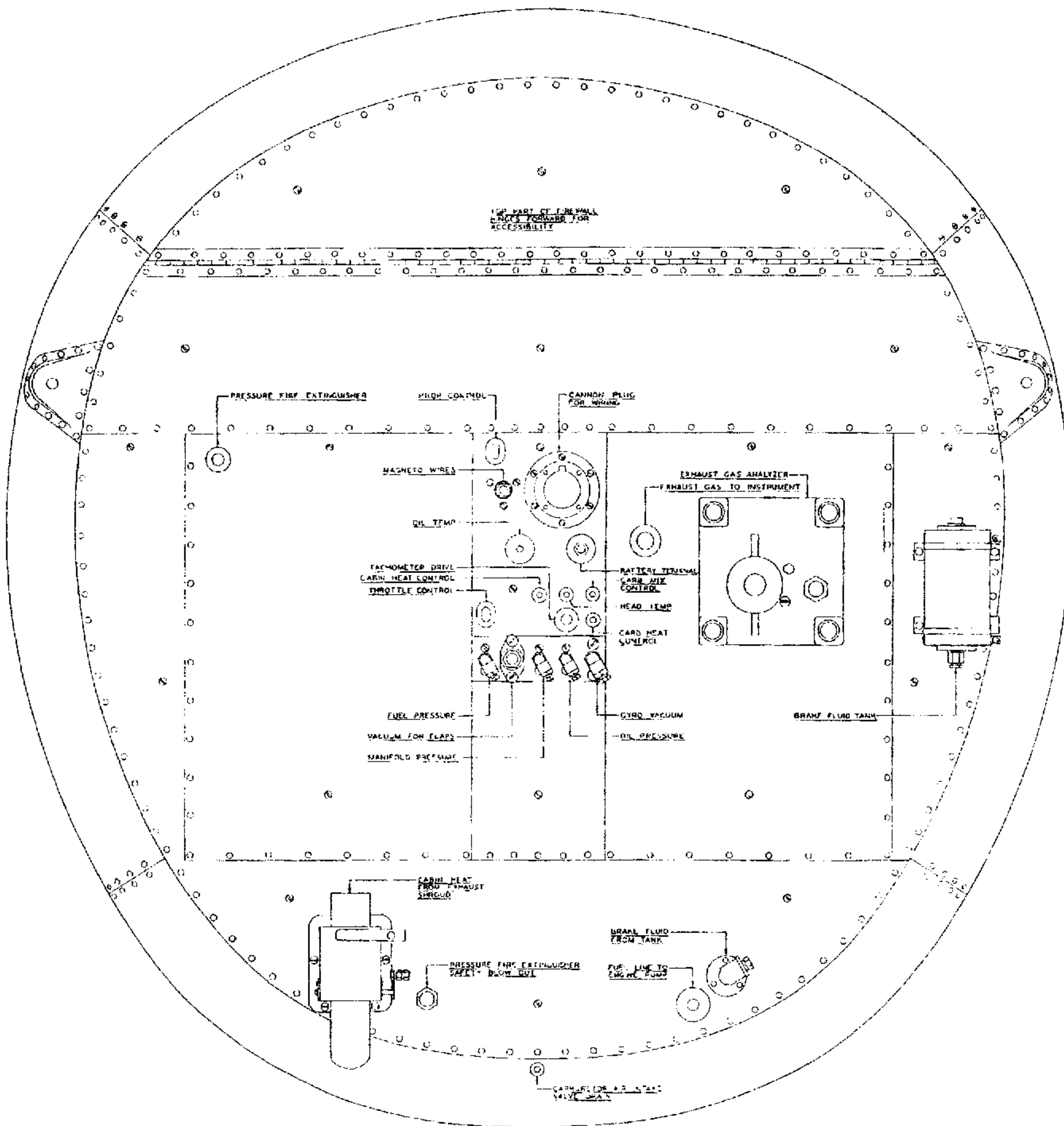
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FRONT VIEW OF FIRE WALL  
SPARTAN EXECUTIVE

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## SECTION VII — POWER PLANT GROUP

### INSTRUCTIONS FOR WARMING-UP ENGINE

Below are listed the main items and suggestions for starting and warming-up the engine. (For further instructions consult your Pratt & Whitney Operator's Hand Book, which is furnished with each Spartan Executive.)

#### STARTING

- (1) Turn propeller over by hand, rapidly as possible, to clear any accumulation of oil or gasoline. This is a good precaution against bent or broken link rods. In cold weather, starting is aided by priming the engine while turning over by hand.
- (2) Put mixture in "full rich" position, turn on fuel supply and slowly pump hand pump until pressure registers three pounds. Greater pressure may cause flooding and present a fire hazard due to back-fire possibility.
- (3) Open throttle equivalent to 600-800 RPM.
- (4) Put carburetor heat control in "cold" position.
- (5) To prime engine, set the mixture control in "full lean" position and pump the throttle 3 to 4 complete strokes. After priming, return mixture control to "full rich" position.

NOTE: A hot engine should never be primed, and a warm engine only partially, otherwise "loading-up" will result.

- (6) Turn ignition switch to "on" position and press starter button.
- (7) After the engine fires, **manipulate** the throttle to get the engine up to 500-600 RPM as quickly as possible. If throttle has been opened too wide, after firing, to obtain this RPM, close quickly because excess air admitted to a cold engine is apt to cause backfires. Once the engine has attained this speed, **leave throttle alone. Do not pump throttle** as it may cause backfires on a cold engine. Pumping the throttle on a warm engine will cause it to "load-up" or choke.
- (8) After engine is started, and is turning over 600-800, put carburetor heat control in "hot" position.
- (9) After one minute of running, open up gradually to 1000 RPM for rest of warm-up.

#### STARTING TROUBLES

- (1) In extremely cold weather, if starting difficulty is experienced, the idle adjustment may be moved to the rich side.

- (2) Do not keep on priming if engine does not start immediately. Find out what is wrong. In extreme cold, however, it may be necessary to prime 5 or 6 strokes.
- (3) Failure to start may be due to overloading with fuel. This can be cleared by opening the throttle wide and turning the engine forward about 4 or 5 revolutions.

#### GROUND RUNNING PRECAUTIONS

- (1) This engine is equipped with pressure cooling baffles. Engines thus equipped can be severely overheated by ground running unless extreme care is exercised.
- (2) The cylinder head temperature should not exceed 400° F. during the warm-up period.
- (3) When opening the throttle further to check the RPM and magnetos, before take-off, the cylinder head temperature should not be allowed to exceed 500° F. in the short burst.

#### GROUND TEST BEFORE TAKE-OFF

- (1) The desired oil inlet temperature is 140°F-167°F and the absolute minimum for take-off is 104°F. The airplane should not be operated for any length of time with a temperature as low as this. (For cold climate operation, refer to your Pratt & Whitney Operator's Handbook).
- (2) Try both magnetos with the ignition switch. Run one magneto only long enough to check RPM. The drop on one magneto should not be more than 100 RPM.
- (3) Fuel pressure should be 4 to 5 pounds.
- (4) Oil pressure should be 70 to 90 pounds.

NOTE: If there is no indication of oil pressure after 30 seconds, **stop** and determine the reason. Do not continue running engine unless oil pressure is obtained.

#### DUST CONDITIONS

The carburetor air intake opening on the Executive is located on the forward side of the baffles inside the engine nose ring, between cylinders numbers 4 and 5. This sheltered position usually solves the problem of dust entering the carburetor. When the airplane normally operates under severe dust conditions, such as unimproved airports, auxiliary fields, etc., Spartan Aircraft Company recommends installing the Standard Air Maze cleaner arrangement.

This assembly has a forward duct, or ram, directly under the engine cowl and takes in the air at the rear edge of the engine nose ring. Installed at the rear of the duct, just before the air enters the carburetor, is a standard No. 5 Air Maze cleaner. This Air Maze is easily removed for cleaning by a single wing nut arrangement without distributing any other part of the airplane.

Spartan drawing No. 7W 1314 shows this information and it will gladly be forwarded to any Executive owner who is interested in this installation. Prices will be quoted by the factory for this modification upon request.

## FUEL SYSTEM (Refer to Fuel System Diagram)

### GENERAL INFORMATION

The Executive fuel supply is 112 gallons. The reserve tank is just aft of the top side of the firewall and holds 15 gallons of fuel. The main tanks are located in the wing stubs and have a total capacity of 64 gallons. To the rear, and below the main tanks, in the lower part of the fuselage are located the auxiliary tanks. These have a total of 33 gallons.

All filler caps are accessible from the outside of the airplane. Hinged doors are provided at these points, and the number of gallons, along with the octane rating are plainly marked on the inside of the doors.

### FUNCTION OF THE FUEL SYSTEM

A brief description of how the fuel system functions is as follows:

The engine driven fuel pump brings the fuel from the tanks to the carburetor. The fuel flows from the tanks to a selector valve which is manually controlled by the pilot. The fuel goes from this valve to the unit which contains the hand wobble pump, by-pass valve, and strainer. Next it goes to the engine driven fuel pump and is forced into the carburetor.

The carburetor air valve is provided with a drain tube which carries off any excess fuel that might occur from flooding the carburetor.

The primer is integral with the carburetor and is operated by pulling out the mixture control and then working the throttle. This action pumps fuel into the induction chamber of the engine.

All fittings and piping are aluminum alloy throughout the entire system.

In case of a leaking tank, the following procedure explains how to remove the fuel tanks:

### RESERVE TANK REMOVAL

- (1) Remove right side of tunnel wall. This tunnel is located between the rudder pedals.

- (2) Disconnect line from fuel tank to selector valve.
- (3) Remove shut-off cock on drain line.
- (4) Remove fuel tank cover.
- (5) Disconnect fuel gauge.
- (6) Let down hinged portion of firewall.
- (7) Disconnect tank straps.
- (8) Disconnect vent line.
- (9) Lift up one end of the tank and remove from airplane.

### MAIN TANK REMOVAL (Wing Stubs)

- (1) Remove wing as described in "wing group."
- (2) Disconnect vent lines on outboard end of tank.
- (3) Disconnect main interconnecting tube in bottom of ship (between tanks).
- (4) Remove Number 2 wing rib diagonal which runs through tank.
- (5) Remove fuel gauge (in left tank only).
- (6) Disconnect tank outlet line to selector valve (left tank only).
- (7) Disconnect tank straps.
- (8) Remove tank in outboard direction.

### AUXILIARY TANK REMOVAL (FUSELAGE)

- (1) Remove front seats.
- (2) Remove carpet and floor boards.
- (3) Disconnect fuel gauge.
- (4) Remove belly plates.
- (5) Disconnect tank outlet line to selector valve. (In left tank only.)
- (6) Disconnect main interconnecting tube between tanks.
- (7) Disconnect tank straps and remove tank in downward direction.

NOTE: On main and auxiliary tanks after airplane has been in service for some time, it may be necessary to cut the interconnecting hose with a knife in order to remove. Should this occur, replace with new hose.

### GROUNDING PRECAUTION

As a precaution against discharging of static electricity, the airplane should be grounded when filling the tanks.

### FUEL STRAINER

The fuel strainer, being a trap for water and sediment, should be drained and cleaned as often as the operating conditions of the airplane necessitates. This unit is accessible through an inspection door on the bottom of the fuselage between the main landing gear wheels.



## OIL SYSTEM—REFER TO OIL SYSTEM DIAGRAM GENERAL INFORMATION

The Executive oil supply is 7 gallons. The oil tank is located in the engine compartment just forward of the firewall.

Oil cooling is supplied by a United Aircraft Products (U. A. P.) cooler. The air is taken to the cooler through a duct which runs forward and through the baffles.

The oil tank is easily filled from the side of the airplane. Oil lines, fittings and hose liners are aluminum alloy. All hose is oil resisting synthetic rubber type.

### TO REMOVE OIL TANK

The following procedure explains how to remove the oil tank.

- (1) Disconnect overflow line.

- (2) Disconnect inlet line.
- (3) Disconnect outlet line.
- (4) Disconnect electrical bonding.
- (5) Disconnect hold-down straps.
- (6) Lift tank straight up and out.

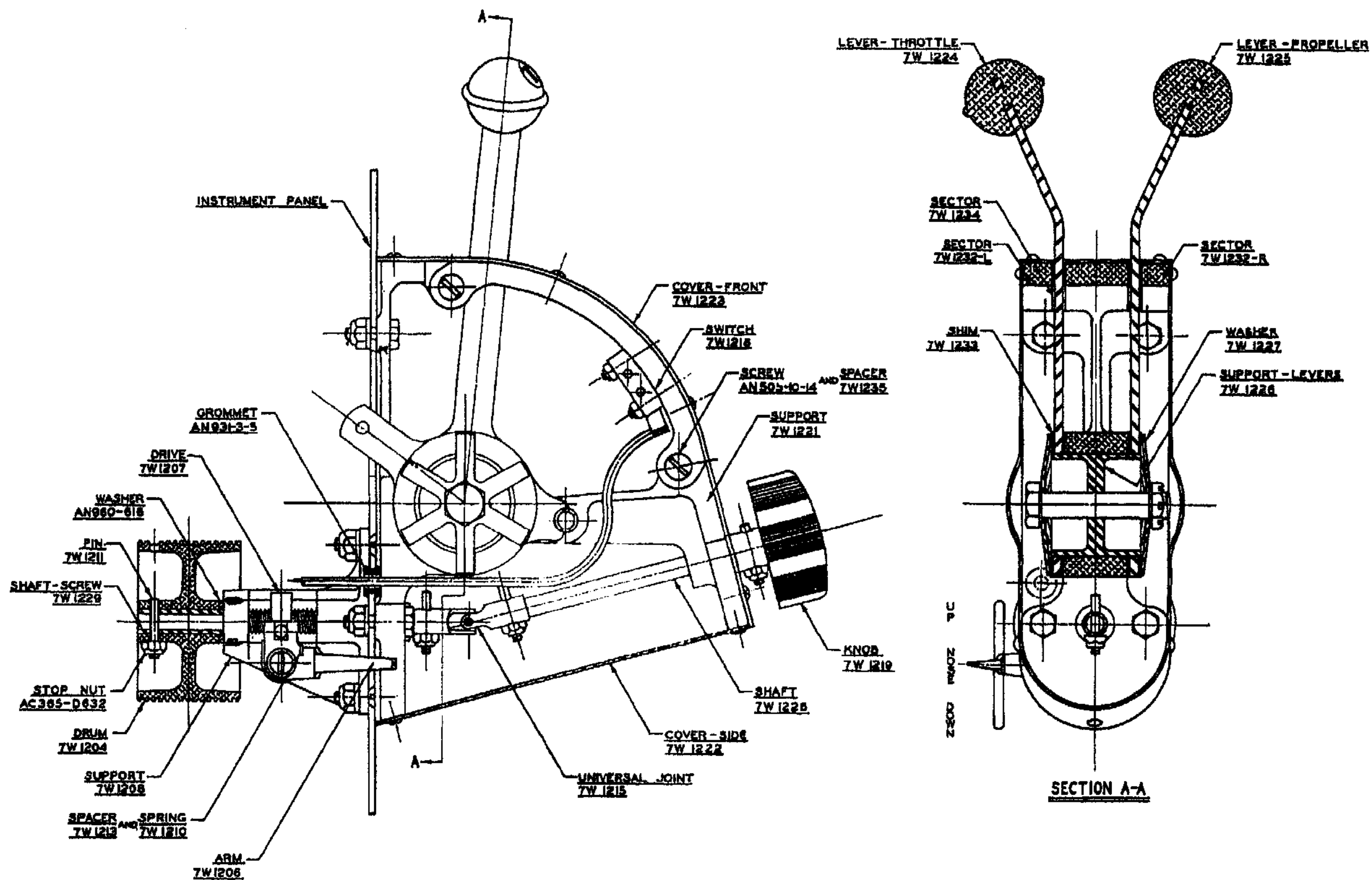
### SPARK PLUGS

The Bendix 9B-52 type spark plugs are recommended for the Spartan Executive.

### ENGINE MOUNT

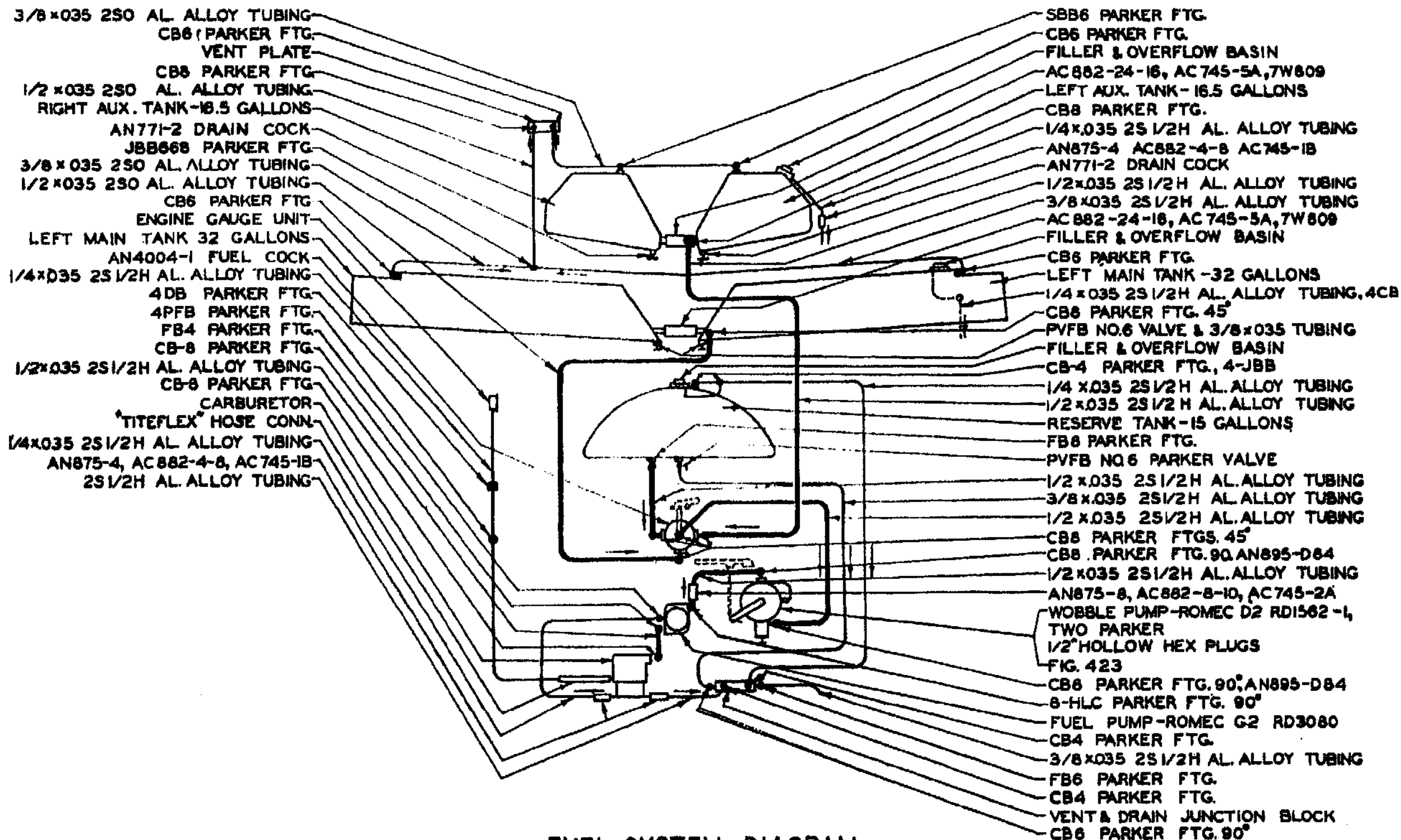
The engine mount structure is chrome-molybdenum (X-4130) steel tubing. The attachment to the engine is made through rubber mountings designed to absorb the torsional fluctuations of the engine. These rubber mountings should be checked at regular intervals and replaced when necessary.

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ENGINE AND TAB CONTROL UNIT

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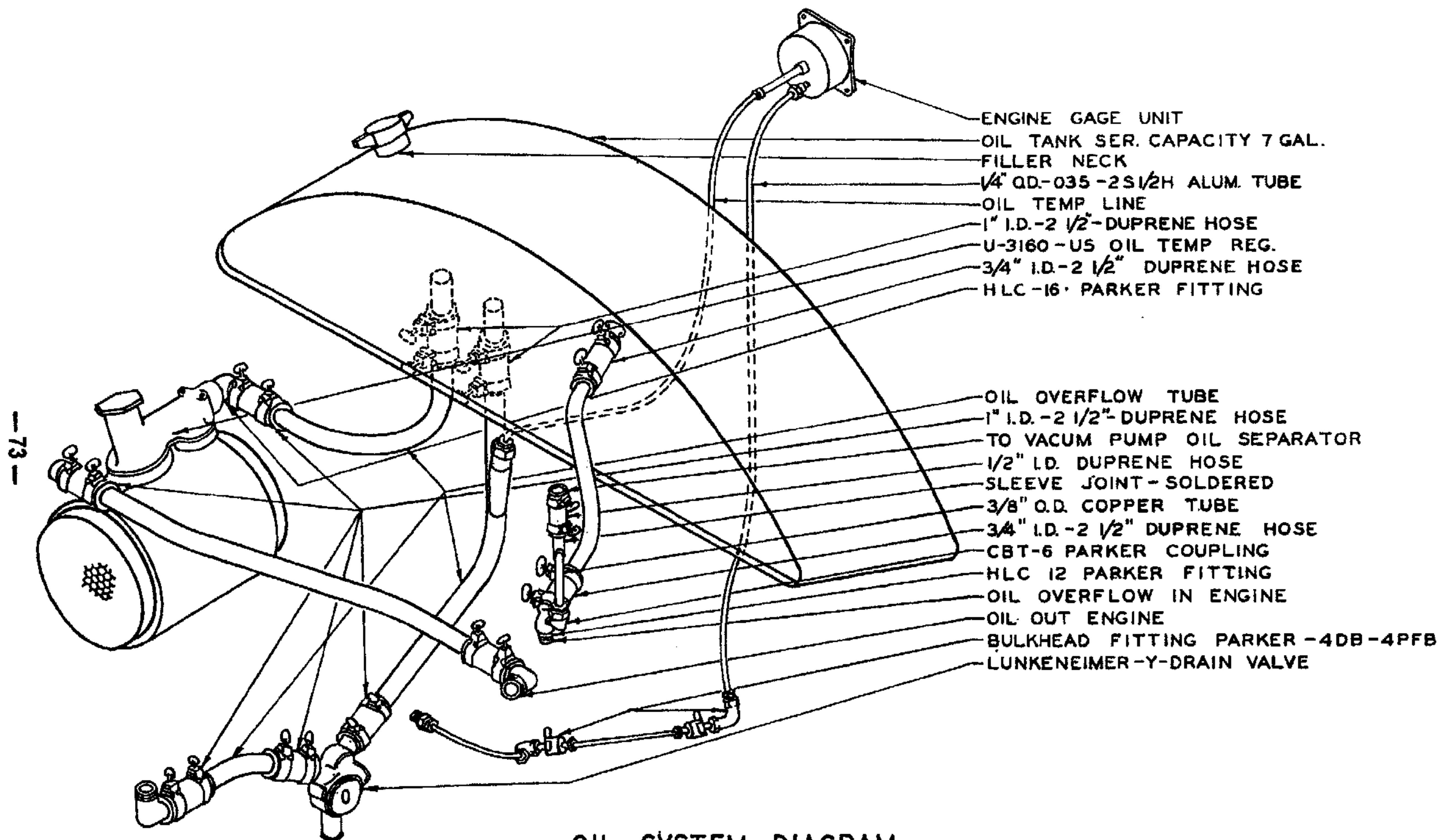


## FUEL SYSTEM DIAGRAM

SPARTAN EXECUTIVE



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OIL SYSTEM DIAGRAM  
 SPARTAN EXECUTIVE

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## SECTION VIII — ELECTRICAL GROUP

### Generator Control System

The Spartan DeLuxe Model Executive is equipped with a 12 volt, 25 ampere generator, and a 12 volt, 35 ampere-hour battery. An automatic generator control box is furnished which regulates both the voltage and amperage output.

#### OPERATION OF GENERATOR CONTROL BOX —DE LUXE MODEL

The function of the generator control box is to hold the voltage output at 14.5 volts under varying amperage output, and at the same time vary the amperage to automatically meet the external load requirements imposed on the system, up to 25 amperes per hour. Thus the proper charge is delivered to the battery at all times without danger of overcharging. A discharged battery will receive the maximum charging rate which will reduce proportionally until it drops to the normal minimum rate of 5 to 6 amperes per hour. In other words, the limits on the control box range from a minimum of 5 to 6 amperes to 25 amperes per hour and are held at a constant voltage, throughout this range, of 14.5 volts.

#### GENERATOR CONTROL BOX —STANDARD MODEL

The generator control box on the Standard Model Executive functions in the same manner as the DeLuxe. The Standard Executive has a 12 volt, 15 ampere generator and a 12 volt, 35 ampere hour battery. The control box limits in this case are 5 to 6 amperes minimum to 15 amperes per hour maximum at a constant voltage of 14.5 volts.

#### GENERATOR CUT-OFF SWITCH

A generator cut-off switch is provided on the instrument panel. This switch grounds the generator output and is thrown to the "off" position while the pilot is communicating by radio or during the period of compass compensation. The switch also allows the pilot to immediately ground the generator output in case the ammeter indicates an excessive over-charge rate. Should an over-charging rate be noted, the trouble will likely be in the generator control box.

#### BATTERY

##### —BATTERY REMOVAL

The battery is an Exide model 6-TS-13-1 and is located under the baggage compartment. To remove battery, proceed as follows:

- (1) Open baggage compartment door and remove floor mat.
- (2) Take off lid of battery box by removing screws.

- (3) In older ships it is necessary to remove bulk-head door at rear wall of baggage compartment. (The factory will furnish information on how to easily correct this situation.)
- (4) Loosen terminals, attach a piece of safety wire to each terminal. Next push the terminals through their entry holes in the box, being sure to anchor the loose ends of the safety wire so that the terminals may be retrieved when replacing battery.
- (5) Remove battery by lifting straight up.

#### FILLING THE BATTERY

- (1) Remove filler caps.
- (2) Add enough distilled water to each cell until it is visible above horizontal baffle plate which can be seen through filler opening.
- (3) Take an ordinary rubber syringe and siphon out water until the horizontal baffle plate is exposed. This is very important because the excess water above the baffle plate will "boil out" through filler openings at high charging rates. When the acid level raises above the bottom end of the filler cap tubes a pressure chamber is formed in the top part of the battery. This pressure becomes greater as the acid rises and soon forces the acid up through the tubes and then the "boiling over" occurs.
- (4) Replace filler caps.

#### GENERAL BATTERY INFORMATION

- (1) Hydrometer reading of the fully charged battery is 1.250 (specific gravity of 1.250).
- (2) The battery filling periods must be judged according to the season and flying operations of the airplane.
- (3) Even though the Executive has a protective coating on all structural parts in the vicinity of the battery, extreme care must be used in battery handling.
- (4) Battery acid will immediately attack any clothing when contacted.

#### LANDING LIGHTS

The landing lights are Grimes type ST-250. These lights are self-retractable and are designed for intermittent burning. They should not be burned for longer than 3 minutes at one time. When burned longer, the light collects enough heat that it may cause the reflector to become smoked, thereby cutting down the efficiency of the light.

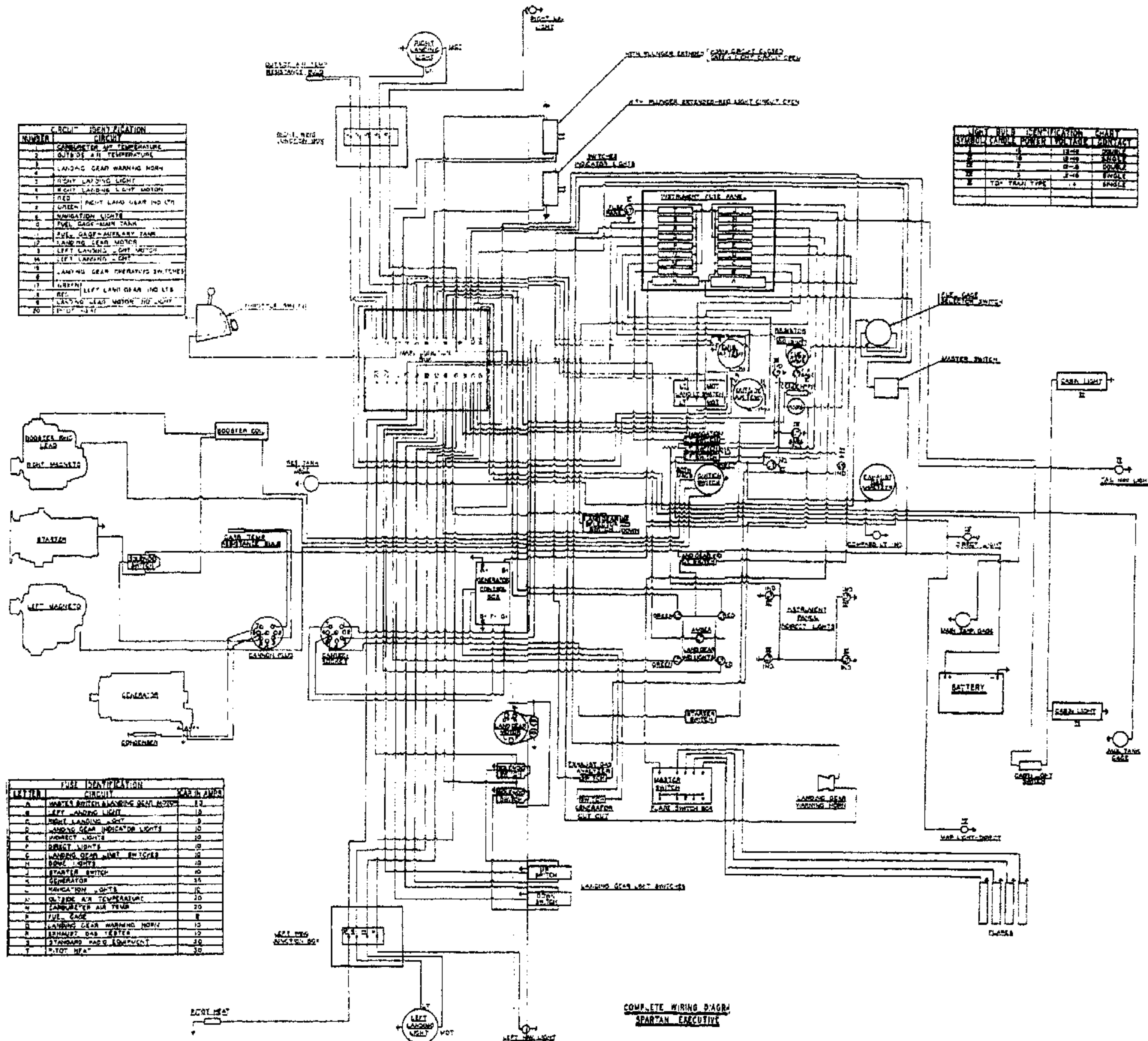
When the tail of the airplane is down, and the lights are completely opened, the beam of light should be parallel with the ground. If for any reason this angle is not correct, the light may be adjusted by loosening the two screws under the motor and sliding the power unit. Adjustment is made with light in open position.

Each light is rated as 315 candlepower, 170,000 beam candles, 15 amperes operating on 12 volts.

Very little care is needed on the landing lights. It is advisable to keep light grease on the retracting gears, and the motor on each light should be oiled with 10 drops of Pyrol yearly.

It has been found, that after long flying periods, the landing lights may not fully retract. This is usually caused by the retracting motor becoming loose on its bracket. Tighten the mounting bolts on the motor.





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## SECTION IX — HUNDRED HOUR CHECK

### Hundred Hour Check

If possible, the airplane should be returned to the factory for hundred hour checks. This is not always possible, however, so listed below is the factory procedure.

### TO PREPARE FOR CHECK

#### ENGINE SECTION

- (1) Remove all engine cowling except nose ring.
- (2) Remove propeller spinner (if applicable).
- (3) Wash down engine section with spray.

#### WING GROUP

- (1) Remove inspection cover over landing gear mechanism.
- (2) Remove upper and lower wing joint gap bands at wing butt.
- (3) Remove inspection plates over aileron pulley bolts. (On upper surface.)
- (4) Remove inspection plates over aileron bell-cranks. (On upper surface.)
- (5) Remove inspection plate at pitot head. (On bottom surface.)
- (6) Remove wheel wells.
- (7) Remove wing tips.
- (8) Extend landing lights.

#### FUSELAGE EXTERIOR

- (1) Remove belly inspection cover plates of auxiliary fuel tanks.
- (2) Remove reserve fuel tank and instruments cover.
- (3) Open inspection door at tail wheel shock strut.
- (4) Remove inspection plate over wiring at main junction box. (Lower front side.)
- (5) Open inspection door at fuel strainer. (On belly.)
- (6) Open all fuel tank drain doors.
- (7) Open baggage compartment door.
- (8) Remove flares.

#### FUSELAGE INTERIOR

- (1) Remove front seats and rails.
- (2) Remove floor carpets.
- (3) Remove floor boards.
- (4) Remove baggage compartment net.
- (5) Remove rear seat cushions.

- (6) Remove rear seat bottom.
- (7) Remove tunnel sides (Between Rudder Pedals.)
- (8) Remove pressure fire extinguisher bottle.
- (9) Remove hand fire extinguisher.
- (10) Open fuse compartment door on instrument panel.
- (11) Remove baggage compartment bulkhead.
- (12) Remove baggage compartment floor mat.
- (13) Remove baggage compartment center floor.
- (14) Remove battery box lid.

#### TAIL GROUP

- (1) Remove round inspection plate at elevator tab control (on under side).
- (2) Remove all tail surface hinge cover plates.

Put airplane on wing jacks at wing hinge points and put jack under tail. Put approximately 200 pounds on tail for safety. Raise until airplane is clear of floor.

Remove main landing wheels and tail wheel.

### CHECK PROCEDURE

#### ENGINE SECTION

- (1) Check engine controls.
- (2) Check propeller for alignment.
- (3) Grease propeller counter-balance mechanism.
- (4) Check wiring installations.
- (5) Check and service exhaust gas analyzer system.
- (6) Check baffles for worn places and cracks.
- (7) Check cowl supports for cracks and looseness.
- (8) Check cowling for cracks.
- (9) Check oil lines.
- (10) Check fuel lines.
- (11) Check instrument lines.
- (12) Check exhaust collector and shroud.
- (13) Check exhaust shield.
- (14) Check carburetor air valve for cracks and bearing wear.
- (15) Check vacuum pump oil separator installation.
- (16) Check oil tank for leaks.
- (17) Check cabin ventilator valve box.
- (18) Check engine mount and attachments for cracks.
- (19) Check starter for operation.

## WING GROUP

- (1) Check skin for loose rivets and cracks (wing and tip).
- (2) Check and tighten wing fittings.
- (3) Check all welds and primary structure for cracks.
- (4) Check wiring.
- (5) Disconnect air speed tubes and blow out.
- (6) Check aileron hinges and control horn.
- (7) Check wing flap hinges and lubricate.
- (8) Check aileron bellcrank, control tube, pulleys and cables.
- (9) Check landing light mechanism and lubricate.
- (10) Check fabric covering on ailerons.
- (11) Put protective coating on control cables.

## TAIL GROUP

- (1) Check cable ends at elevator and rudder horns.
- (2) Check rudder cable for wear at entry to fuselage.
- (3) Check elevator tab control mechanism and lubricate.
- (4) Check elevator cable for clearance through stabilizer.
- (5) Check all hinges and lubricate.
- (6) Check fabric covering.

## FUSELAGE EXTERIOR

- (1) Check skin for loose rivets and cracks.
- (2) Check all visible steel structure for cracks.
- (3) Check main junction box terminals.
- (4) Drain tank sumps.
- (5) Drain and clean strainer.

## FUSELAGE INTERIOR

- (1) Check reserve tank for leaks.
- (2) Drain reserve tank sump.
- (3) Check fuel lines from tanks, to selector valve, to wobble pump unit to firewall, for looseness, leaks and clearance.
- (4) Check all tank straps and supports.
- (5) Check all controls for ease of operation and clearance.
- (6) Check control column for looseness and safetying. Lubricate.
- (7) Check all wiring from instrument panel to firewall.
- (8) Check all plumbing from instrument panel to firewall.

- (9) Check all vacuum lines in flap system.
- (10) Check navigation lights for operation.
- (11) Check wing landing lights for operation.
- (12) Check tab cables from instrument panel to bulkhead in rear which mounts the spools. Lubricate parts.
- (13) Inspect cables running to control column for frayed ends and clearance.
- (14) Check aileron cable and chain joint at control column.
- (15) Inspect steel structure for cracks.
- (16) Inspect bulkheads and inside of skin for cracks.
- (17) Check operation of all controls on instrument panel for operation.
- (18) Check seats, rails and belts.
- (19) Inspect tab, elevator, and rudder control cable for frays.
- (20) Put protective coating on all cables.
- (21) Check elevator push and pull tube and bellcrank. Lubricate.
- (22) Inspect all pulleys in control system.
- (23) Check flap vacuum cylinder group.
- (24) Check wing flap universal joint.
- (25) Check wing flap bearing and lubricate.
- (26) Check belly flap hinges and lubricate.
- (27) Check flap vacuum tank and mounting.
- (28) Check fuel tank mountings for cracks and looseness.
- (29) Check fuel vent system.
- (30) Check fuel tank gauge for operation.
- (31) Check generator current and voltage regulator.
- (32) Check control cable mountings on rear fuselage bulkhead. Lubricate tab drive drums.
- (33) Check flare circuits.
- (34) Check and weight pressure fire extinguisher cylinder.
- (35) Check and charge hand fire extinguisher.
- (36) Check all wiring circuits for operation. Make visual check of condition of wiring. Check terminals for looseness.
- (37) Check and service battery.
- (38) Change filters on Gyro-Horizon and Directional-Gyro.
- (39) Blow out Gyro System lines and Air Speed lines.

## LANDING GEAR

- (1) Check operation of gear using motor.
- (2) Check operation of gear using hand crank.



- (3) Check internal mechanism in gear boxes and pack with grease. Reassemble covers and switches.
- (4) Set limit switches for proper operation.
- (5) Inspect and lubricate retracting motor and miter gear box mechanism.
- (6) Check torsion drive tubes and universal joints for looseness.
- (7) Check for looseness in chain drive to hand crank.
- (8) Check wiring for looseness or deterioration.
- (9) Check all surrounding structure and attachments for cracks.
- (10) Check and tighten scissors on shock struts.
- (11) Grease 6 fittings on each strut.
- (12) Check and service shock struts for oil level and pressure.
- (13) Check indicator lights and warning horn for operation.
- (14) Check brake system for operation.  
(a) Adjust brake discs if necessary.
- (15) Check tires for breaks.

- (16) Pack wheels with grease.
- (17) Check wheels for free rolling.
- (18) Check wheel fork for bolt-elongation and cracks.
- (19) Check shock strut top casting and lubricate.
- (20) Check linkage setting.
- (21) Check tension tubes for cracks and wear. Lubricate.
- (22) Check retraction motor for proper tension.

#### TAIL WHEEL

- (1) Check swivel action for free movement, looseness, and lubricate.
- (2) Check support casting and lubricate.
- (3) Check support casting bearing points for wear.
- (4) Check shock strut and oil level.
- (5) Inspect tire for breaks.
- (6) Pack wheel with grease.

After final check by inspector, clean interior and exterior of airplane before returning to customer.



# SECTION X — LUBRICATION

## LUBRICATION TABLE

No.	NAME	Type of Lubrication
EVERY 10 HOURS		
1	Propeller Hub	Mobile No. 2
2	L. G. Hand Crank Sprocket Brg.	S.A.E. No. 10 Oil
3	Wing Flap Torque Tube Brgs.—Center	S.A.E. No. 10 Oil
4	Flap Cylinder Piston Rods	S.A.E. No. 10 Oil
5	Wing Flap Torque Tube Brgs.—Outboard	S.A.E. No. 10 Oil
6	Elevator Tab Drive Screw, Hinge and Arm	S.A.E. No. 10 Oil
7	Wing and Fuselage Flap Hinges	S.A.E. No. 10 Oil
EVERY 20 HOURS		
8	Propeller Governor Bearings	Keystone No. 44 or Equiv.
9	Tab Control Mechanism	S.A.E. No. 10 Oil
10	Throttle and Propeller Control	S.A.E. No. 10 Oil
11	Parking Brake Latch	S.A.E. No. 10 Oil
12	Parking Brake Bearing	S.A.E. No. 10 Oil
13	Toe Brake Mechanism	S.A.E. No. 10 Oil
14	Control Column	Alemite Cup Grease or Equiv. and S.A.E. No. 10 Oil
15	Elevator Tab Drive Drum Bearing	S.A.E. No. 10 Oil
16	Landing Gear Universal Joints	S.A.E. No. 10 Oil
17	Landing Gear Link Tubes	S.A.E. No. 10 Oil
18	Landing Light Hinge Bearings	S.A.E. No. 10 Oil
19	Elevator and Rudder Hinge	S.A.E. No. 10 Oil
20	Tail Wheel Attachment Points	S.A.E. No. 10 Oil
21	Tail Wheel Centering Spring Swivel	S.A.E. No. 10 Oil
EVERY 100 HOURS		
22	Brake System Reserve Tank	Univis No. 40
23	Landing Gear Hand Crank Chain	Alemite Cup Grease or Equiv.
24	Landing Gear Gear Boxes	*Spartan Special Lubricant
25	Landing Gear Wheels	Short Fibre Wheel Brg. Grease
26	Landing Gear Shock Struts and Scissors	Delco Shock Absorbing Fluid and Alemite Cup Grease or Equiv.
27	Landing Light Motor Gears	Alemite Cup Grease or Equiv.
28	Tail Wheel Shock Strut	Delco Shock Absorbing Fluid
29	Tail Wheel Swivel Bearings	Alemite Cup Grease or Equiv.
30	Tail Wheel Bearings	Short Fibre Wheel Bearing Grease

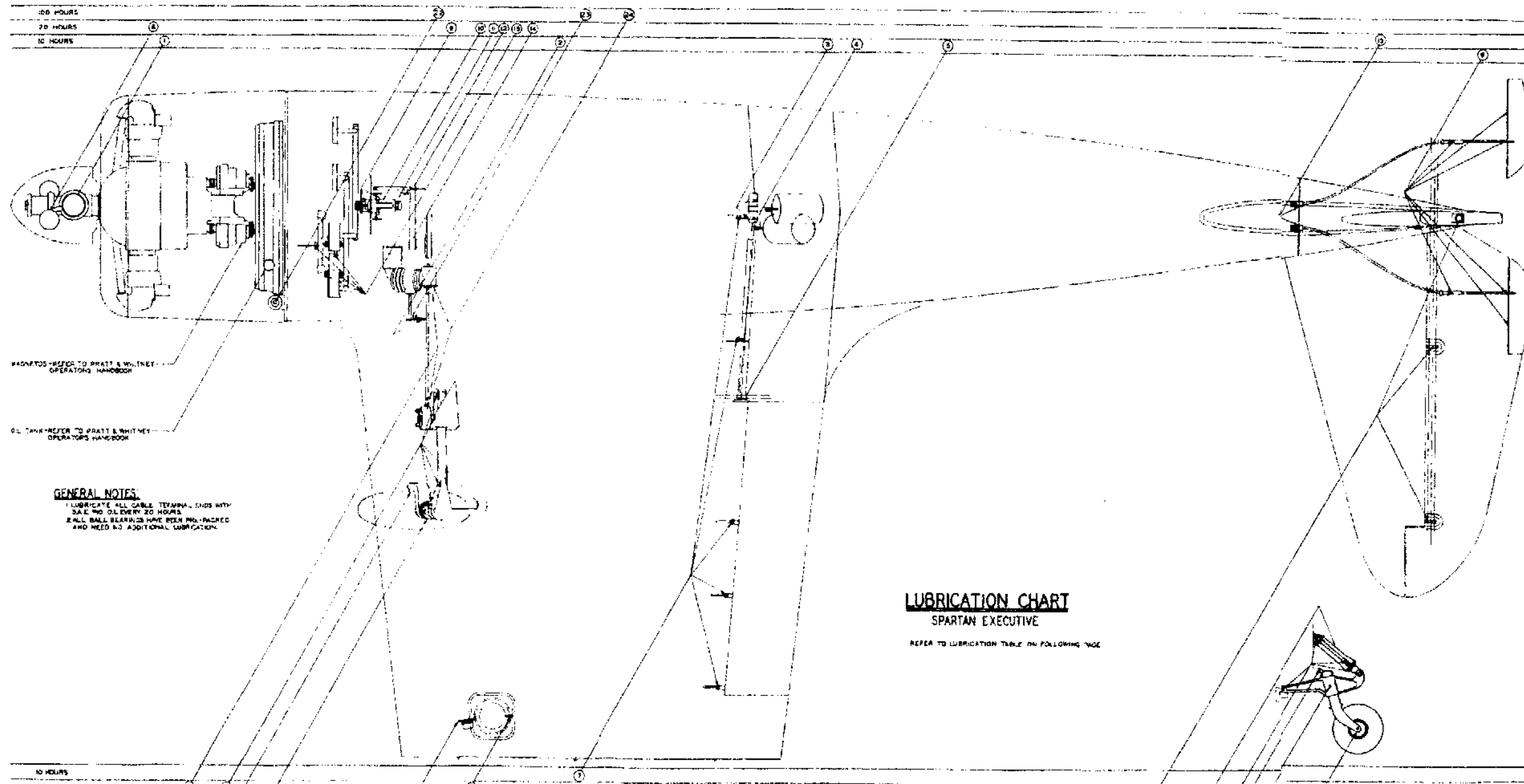
\*Spartan Special Lubricant for Landing Gear Gear Boxes.

Spartan Aircraft Company prepares a special lubricant for the landing gear gear boxes. This lubricant has proven very satisfactory under all conditions of cold weather and high altitude operations.

This lubricant may be purchased from our factory or mixed according to the following portions:

10 Parts of Rocker Arm Grease  
10 Parts of Graphite Grease  
2 Parts of S.A.E. No. 10 Oil  
1 Part of Marvel Oil

NOTE: In extreme cold conditions more Marvel Oil should be added.



**END OF MANUAL**