HELIO AIRCRAFT CORPORATION
PITTSBURG, KANSAS
FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
HELIO H-250 WITH 120 GALLON FUEL SYSTEM

This document is FAA approved and must be attached to the basic Airplane Flight Manual when the Helio 120 gallon fuel system is installed on the aircraft. The information in this Airplane Flight Manual Supplement supersedes the basic manual only with respect to items contained herein.

I. LIMITATIONS

C. Fuel: 100 octane minimum grade gasoline
118 gallons usable

K. "CAUTION! MONITOR MAIN FUEL QUANTITY DURING AUXILIARY TRANSFER TO AVOID OVERFLOW (LEVEL FLIGHT ONLY)"

II. PROCEDURES

A. Normal Procedures

4. Burn main fuel down to 1/4 before starting to transfer fuel from auxiliary tanks. When main tanks are 3/4 full, stop transfer until main tank supply is again 1/4 full. Transfer fuel from both auxiliary tanks simultaneously.

B. Emergency Procedures

2. In case of an asymmetrical fuel load in auxiliary tanks it is recommended that a no flap landing be made because of lateral control.

APPROVED: Paul L Clark
for John A. Carran, Chief
Engineering & Manufacturing Branch
Central Region

DATE: 3/22/65

HELIO AIRCRAFT CORPORATION
PITTSBURG, KANSAS
FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
HELIO H-250 WITH EDO 582-3430 FLOATS

This document is FAA approved and must be attached to the basic Airplane Flight Manual when equipped with Edo 582-3430 floats per Helio drawings. The information in this Airplane Flight Manual Supplement supersedes the basic manual only with respect to items contained herein. For other information refer to the basic manual.

I. LIMITATIONS

J. Center of Gravity Limits (With Edo 582-3430 floats the rear C.G. is restricted to 109")

105.0 to 109.0 at 3400 lbs.
97.5 to 109.0 at 2150 lbs. or less
Straight line variation between points

II. PROCEDURES

A. Normal Procedures

4. Retract water rudder for takeoff and landing.

OPERATION AND MAINTENANCE

MANUAL

HELIO COURIER II MODEL H-250

Serial #_____ Reg. #_____

FAA APPROVED

AIRPLANE FLIGHT MANUAL

HELIO AIRCRAFT CORPORATION
PITTSBURG, KANSAS

Model H-250
Serial Number_____

FAA Identification Number_____

(THIS DOCUMENT MUST BE KEPT IN THE AIRPLANE AT ALL TIMES)

APPROVED: Harvey H Van Dyke
for John A. Carran, Chief
Engineering & Manufacturing Branch
Central Region

Date: November 6, 1964

HELIO MODEL H-250

AIRPLANE FLIGHT MANUAL

LOG OF REVISIONS

Rev. No.	Page Number(s)	Description	Date of Revision	Approved By

Prepared by: Engineering & Manufacturing Branch, Central Region

HELIO MODEL H-250

AIRPLANE FLIGHT MANUAL

RECORD OF SUPPLEMENTS

[illegible]	Description	Date of Revision	Approved By*

* Chief Engineer, Engineering & Manufacturing Branch, Central Region

HELIO MODEL H-250

AIRPLANE FLIGHT MANUAL

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FAA APPROVED

Date: 12/3/64

RILEY MODEL R-250

AIRPLANE FLIGHT MANUAL

I. Limitations

The following limitations must be observed in the operation of this airplane:

A. Engine: Lycoming Model O-540-A1A5

B. Engine Limits: All operations, 2575 RPM (250 HP)

C. Fuel: 100 minimum grade aviation gasoline

D. Propeller: Hartzell controllable, Hub HC-92ZK-1D
Blade 8247
Diameter: not over 88 in., not under 86 in.
Pitch settings at 30 in. station; low 13°,
high 29.0°

E. Power Plant Instruments:

Cylinder Head Temp: Green Arc: 250°F - 500°F
(Normal Operating Range)
Red Radial: 500°F

Manifold Pressure: Green Arc: 15 - 29.1 in. Hg.
(Normal Operating Range)

Oil Temperature: Green Arc: 170° - 245°F
(Normal Operating Range)
Yellow Line 170°F
Red Radial: (Max) 245°F

Oil Pressure: Green Arc: 60 to 85 psi
(Normal Operating Range)
Red Radials: 25 and 85 psi
Yellow Arc (Caution): 25 - 60 psi

Fuel Pressure: Green Arc: 0.5 to 8 psi
(Normal Operating Range)
Red Radials: (Min) 0.5 and (Max) 8 psi

Tachometer: Green Arc: 1800 - 2575 RPM
(Normal Operating Range)
Red Radial: 2575 RPM

Carburetor Air Temperature: Yellow arc (Caution Danger of Icing)
6°C to 10°C

FAA Approved
Date: 12/3/54

SECTION V LIMITATIONS (Cont'd)

F. Airspeed Limits: (Calibrated Airspeed)

Never Exceed (V_{NE})	189 mph (Red Radial)
Caution Range	150-189 mph (Yellow Arc)
Design Cruising Speed (V_C)	150 mph
Normal Operating Range	63-150 mph (Green Arc)
Max. Design Maneuvering Speed (Vp)	94 mph
Max. Flap Extension Speed (V_F)	70 mph
Flap Operating Range	50-70 mph (White Arc)

NOTE: Airspeed instrument markings and their significance:

1. Radial RED line marks the never exceed speed, which is the maximum safe airspeed.

2. YELLOW arc on indicator denotes range of speeds in which operations should be conducted with caution and only in smooth air.

3. GREEN arc denotes normal operating speed range.

4. WHITE arc denotes speed range in which flaps may be safely lowered.

G. Maneuvers: Normal category maneuvers only are approved.

H. Flight Load Factors: (At max. gross weight of 3400 lbs.)

Maneuver: Positive: 3.8g Negative: 1.5g
Flaps extended: 2.0g

WARNING: 1. Use controls with caution above 125 mph (109K) CAS.

2. In gusty air, it is advisable to reduce cruising speed below normal, and in severe turbulence reduce speed below 94 MPH (flaps up) and below 65 MPH (flaps down).

I. Maximum Weight: 3400 lbs.

J. Center of Gravity Limits: (105.0) to (110.0) at 3400 lbs.
(97.5) to (110.0) at 2150 lbs. or less.
Straight line variation between points given.

J. Center of Gravity Limits: (Cont'd)

Datum: is 60 inches forward of fuselage Station 0. (Station 0 is at upper attachment of engine mount to fuselage).

NOTE: It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded.

K. Placards

"THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATION LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUAL"

"NO ACROBATIC MANEUVERS INCLUDING SPINS APPROVED"

ON PILOT WINDOW HANDLE "WARNING - DO NOT OPEN WINDOW ABOVE 60 MPH IAS.

II PROCEDURES

A. Normal Procedures

1. Wing Flap Settings: Takeoff: 0°-30° (15 turns from full up - 3 from full down = 30°)
   Cruise: 0° (Full up - retracted)
   Landing: 40° (18 turns from full up)

2. Maximum 90° crosswind velocity demostrated: 10 mph.

3. Carburetor icing: Use carburetor air heat control full ON.

B. Emergency Procedures

1. Engine Failure

Maintain airspeed of at least 60 mph if using 40° flaps.

FAA Approved
Date: 11/6/64

W A R R A N T Y

The products purchased herein are covered by the following Manufacturer's warranty and no other warranty:

(A) Helio Aircraft Corporation warrants those products purchased herein that are new manufactured by Helio Aircraft Corporation or Mid-States Manufacturing Division of Helio Aircraft Corporation to be free from defects in material and workmanship under normal use and service, provided, however, that the liability of Helio under this warranty is limited to replacing or repairing any parts or part of such products which shall be returned to the Mid-States factory at Pittsburg, Kansas with transportation prepaid, within sixty (60) days or 50 flying hours, whichever shall first occur after delivery, and which shall upon examination by Helio or its agents be disclosed to the satisfaction of Helio to have been thus defective. This warranty shall not in any way apply to or cover any products purchased herein which may in any manner be altered or repaired outside of the factories of Helio Aircraft Corp. or Mid-States Mfg. Division of Helio Aircraft Corp. Any part or parts replaced or repaired by Helio pursuant to this warranty shall be subject to this warranty, but Helio makes no further warranty of any aircraft or part thereof of which such part or parts are a part, or of the workmanship, if any, involved in fitting such part or parts in such aircraft. No warranty is made with respect to parts, equipment or accessories not manufactured by Helio Aircraft Corporation or by Mid-States Mfg. Division of Helio Aircraft Corp., such as engines, propellers, fuel pumps, tires, wheels, instruments, magnetos, or any parts, equipment and purchaser must make all claims for any defects in such parts, equipment or accessories to the respective makers thereof.

(B) The warranty provisions contained in section (a) of this paragraph are expressly in lieu of (and Purchaser hereby waives) all other warranties, express, statutory, or implied in fact or by law, and all other remedies against Manufacturer and Distributor for consequential or other damages, arising out of the sale, use, or operation of the products purchased herein. The distributor neither assumes nor authorizes any other person or business organization to assume for it any other warranty or liability in connection with the sale, use or operation of the products purchased herein.

(C) The warranty provisions outlined above in this paragraph extend to cover the original retail purchaser only and are not assignable without written consent of Helio Aircraft Corporation.

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SECTION I

A. General Description of Airplane

The Courier II is a high wing monoplane. The wing is fully cantilever and of all metal construction. The fuselage cabin section is a metal covered tubular structure and the aft section is an all metal semi-monocoque. The tail surfaces are of all metal construction. Power is supplied as follows:

Model	Engine	Propeller
H-250	Lycoming (250 hp) O-540-A1A5	Hartzell constant speed 88" dia.

The Model H-250 is a six place plane. The occupants are seated in two side-by-side seats and a two place jump seat. Entrance to the front seat is through a left front door, the window of which can be opened by the pilot. Entrance to the rear seats is through a rear right door, the sill of which is at floor level height for easy loading and unloading. The baggage compartment is located behind the jump seat. Access to the baggage compartment is readily attained by tilting forward the back of the rear seat. The rear seat is easily removable for added cargo space.

Surface control is by conventional wheel and rudder pedals. Provisions are made for wheel, rudder pedals and brakes on the right side. Toe brakes are provided on the left side. The flaps are actuated by a hand crank. Longitudinal trim is by an elevator trim tab actuated by a hand crank.

The airplane is equipped with long span slotted flaps and full span leading edge slats for high lift operation. Lateral control is obtained by short span Frieze ailerons operated in conjunction with leading edge interceptors. The latter are provided for low-speed control. Pitch change is obtained with an all-moving horizontal tail. Directional control is obtained with a conventional type rudder.

The engine section is composed of the engine installation, oil cooler, carburetor, ram air filter screen, oil system piping, fuel system piping, electrical system, cowl flap system and the necessary mechanical control units. The engine section is completely enclosed by aluminum wrap-around cowls and nose-cowl. The engine mount is a welded steel tube structure bolted to the forward end of the fuselage. The engine is suspended on the engine mount by four vibration isolators. The firewall is of stainless steel.

The main landing gear is located exceptionally far forward and is, in fact, immediately ahead of the firewall. The cross-wind gear is special equipment.

The H-250, Courier II, is completely modified for float installation except for fairings, steps and other miscellaneous parts and hardware.

B. DESCRIPTION OF STRUCTURE

WING PANEL. The wing is a two-panel full-cantilever unit and all metal construction. Ribs are formed 24ST alclad members. The main spar consists of a 24ST alclad web and 24ST extruded angle capstrips. The rear spar is a 24ST alclad formed channel. The wings are attached to the fuselage through a welded steel truss.

AILERONS AND INTERCEPTORS The ailerons are of the Frieze type, of 24ST alclad diagonal rib truss structure, fabric covered. They are hinged at both ends and operated by a push-pull tube at the center. The interceptors consist of heavy aluminum alloy curved plates (on each side of the airplane). They emerge from the wings in conjunction with the ailerons.

FLAPS The flaps are of a single spar all-metal construction. They are supported to the wing structure by flap tracks and are actuated by push-pull tubes at the center and outboard tracks.

TAIL GROUP The tail group is composed of a vertical fin and rudder, and an all-movable horizontal surface equipped with an anti-balance and trim tab. All tail surfaces are of aluminum alloy construction.

FIN:	Two-spar construction
RUDDER:	Single-spar construction
STABILATOR:	Single-spar construction

FUSELAGE The forward fuselage structure is a welded steel tube tuess. It is covered with alclad sheet in the cabin section; the remaining portion is semi-monocoque. The two forward seats of welded steel tube construction stressed for deceleration of 15 g's.

LANDING GEAR The main landing gear is a heat-treated steel box section. Each strut is individually sprung with an air-oil shock strut. Exceptional stroke is provided to reduce the landing load factor.

The tail wheel gear is conventional and is fabricated of steel weldments. The tail-wheel fork is a heat-treated part.

C. SPECIFICATIONS

Gross Weight	3400 lbs.
Empty Weight (Average)	1870 lbs.
Wing Span	39 ft.
Wing Chord	72 in.
Wing Area (Slats retracted)	231 sq. ft.
Overall Length	31 ft. 6 in.
Aileron Area (Each Surface)	10.35 sq. ft.
Flap Area (Each Surface)	19.05 sq. ft.
Slat Span (Each Wing)	203.93 in.
Stabilator Area	37.50 sq. ft.
Rudder and Fin Area	24.40 sq. ft.
Wheel Tread	108.00 in.

Fuel Capacity (not including 2.5 gal. gas usable under certain flight conditions)	58.2 gals.
Octane Rating	100
Oil Capacity	12 qts.
Power Plant	O-540-A1A5 Lycoming
Take-off horsepower	250
Normal Rated Horsepower	250

Standard Equipment:

Hartzell Constant Speed Hydraulic Propeller
20 amp Generator and 12 volt Battery
Reduction-Gear Starter
Two 30 Gallon Wing Tanks
Electric Auxiliary Fuel System
Recording Tachometer
Manifold Pressure Gauge
Gauge Unit, Engine (Includes Oil Pressure, Oil Temperature, Cylinder Head Temperature, Ammeter and Dual Electrical Fuel Gauges)
Outside Air Temperature Gauge
Electric Turn and Bank Indicator
Compass
Full Swivel, Lockable Tail Wheel, Cockpit Controlled
Retractable Ground Handling Bars
Carburetor Heat Indicator
Structural Modifications & Fittings for Floats
Rear Sling Seat
All Bearing Controls
Hydraulic Brakes
Hand Operated Parking Brake
Adjustable Instrument Panel Lights
Navigation Lights
Utility Pilot - Co-pilot Seat
Shock Mounted Instrument Panel
Sensitive Altimeter
Airspeed Indicator

Optional Equipment:

Goodyear Cross-Wind Landing Gear
Goodyear Cross-Wind Landing Gear Lock (Cockpit Control)
Deluxe Instrument Panel (Gyro Horizon, Directional Gyro, Rate of Climb, Vacuum System and Gauge, Eight-day clock)
Engine Driven Vacuum System (included in above)
Defroster
Grimes Rotating Beacon Light
Grimes Retractable Landing Light
Additional Cabin Ventilation -- Four Individual Window Vents
Complete Two-color Paint Job
Radio Cabin Speaker (overhead)
Rudder and Aileron Control Lock Kit
Heated Pitot Tube
Fire Extinguisher and First Aid Kit
External Electric Plug-In
Eyebrow Instrument Lighting
Three Enlarged Tailcone Access Holes
Cargo Door - Utility Seat Combination - with Relief System and "D" Rings
Utility Door, Folding Front Seat, Litter Configuration
Dual Controls (Right Hand Control Wheel & Rudder Pedals)
Dual Controls with Dual Brakes
50 Amp Generator and Voltage Regulator
Middle Seat, 2-place
Internal corrosion proofing (zinc chromate)

SECTION II - FLIGHT AND OPERATING INSTRUCTIONS

A. Flight Controls

The Courier 11 incorporates flight control devices to insure safe flight at the slow air speeds without detriment to high-speed flight. The cockpit controls, however, are conventional and their operation is the same as in any other fixed-wing airplane. The exceptional degree of control is obtained by the use of leading edge slats, large flaps, interceptors and a fully movable horizontal tail surface with its anti-balance tab. Each control is described in detail in the following discussions.

AILERONS The ailerons are operated in a conventional manner by either of the dual control wheels. In addition to the ailerons, the control wheels actuate interceptor blades which extend through the upper surface of the wing directly behind the outboard slat. The ailerons are conventional and they provide the normal corrective forces at high speeds. The interceptors provide the extremely positive lateral control at the slowest speeds obtainable. This control is so effective that it is possible to overcome the effect of full rudder in a stall by use of the aileron-interceptor control and roll into a turn in the opposite direction. The aileron-interceptor combination produces a very high rate of roll at all speeds with comparatively small control movements. Violent, full throw control movements are not necessary to produce satisfactory rates of roll at all airspeeds.

RUDDER The rudder controls are conventional. Toe brakes are provided on the left-hand pair of pedals (pedal adjustment - see page 15).

STABILATOR The horizontal tail surface, or stabilator, is a single movable surface instead of the usual elevator and horizontal stabilizer. The control operation is conventional and control feel and reaction in the cockpit are the same as in other aircraft.

There are two tabs attached to the horizontal surface, a trim tab and an anti-balance tab. The right hand surface has the anti-balance tab attached to it. It is an anti-balance tab because it moves in the same direction as the surface, thus providing a force which alway returns the surface to the trim position. The actuating arm and pivot point for this tab, which is mounted on the fuselage directly under the fin, should be inspected as a part of the daily pre-flight inspection.

The trim tab is located on the left hand surface. It is of the conventional type and is actuated by a small crank just below the flap actuating control. .. trim tab position indicator is located overhead to the rear of the flap and trim controls.

SLATS The leading edge wing slats operate fully automatically by the airloads on them. Their use provides the very slow speeds possible with this airplane. All slats are fully visible from the cockpit. They should always be open in the final approach. If it appears that any of the four slats have stuck, it is advisable to land about 10 mph faster than minimum approach speed.

It should be noted that the lateral and directional control is so effective that through their normal use it is possible to overcome the effects of both slats remaining closed on one side.

A. FLIGHT CONTROLS (Cont'd)

FLAPS Eighteen turns on the hand crank centered overhead between the two pilots lowers the flaps 40°. Fifteen turns on the crank provides approximately 30° of flap. Full flap should be used for landing under all normal wind conditions. Shortest takeoff runs, under standard air, sea-level conditions, are performed with 30° flaps, although 20° will give a better rate of climb once the airplane is airborne and provides better take-off at higher altitudes, or with gross loads.

B. PRE-FLIGHT INSPECTION

1. Pull propeller through several revolutions and inspect blades for nicks and cracks.

2. Open engine cowl; check oil level and inspect fuel and oil lines for leaks. Give engine compartment a complete visual check.

3. Check landing gear strut inflation and inflation of tires.

4. Fuel shut off valve should be opened prior to draining of the gascolator bowl.

5. Drain sediment bowl. (Accessible through small door under the forward window on right side fuselage).

6. Check fuel load and make certain that the gas caps are firmly secured on the fillernecks.

7. Check slat operation for freedom of movement and any unusual play.

8. Move all control surfaces and check security of all hinge bolts and push-pull tubes.

9. Check security of anti-balance tab on horizontal tail and its pivot point on the fuselage.

10. Remove cover from pitot head forward on left wing leading edge and make sure it is free from dirt or other obstructions. Also make sure that static pressure vents on the sides of the fuselage aft the baggage compartment are free of dirt.

CAUTION!!!! WHEN CLEANING OR WAXING AIRPLANE, DO NOT ALLOW WAX OR CLEANER TO PLUG STATIC VENT HOLES.

After entering the airplane and before starting the engine:

1. Adjust and fasten the combination shoulder harness which gives excellent protection and still allows freedom of movement.

2. Check all controls for freedom of movement.

3. Insure that all cargo is secured and that the load is properly located. (See Section V)

4. Check position of electrical and ignition switches.

5. Open cowl flaps.

B. PRE-FLIGHT INSPECTION (Cont'd)

ENGINE STARTING The following starting procedure is taken from the Lycoming Operator's Manual. A copy of the Lycoming Manual is furnished with each airplane and is considered a part of this manual.

Lock the wheels by either wheel brakes or chocks.

Set the propeller control lever all the way forward in INCREASE RPM position.

Be sure fuel valve is "ON".

Set throttle to 1/10 open position.

Place mixture control in the "Full Rich" position (Full In).

In warm climate, pump the throttle 4 to 6 cycles.

In cold climate, pump the primer 3 to 4 cycles.

Turn ignition switch to extreme right and push (this energizes starter).

When the engine begins to fire, immediately release ignition switch. On cold starts, additional priming may be necessary.

If oil pressure does not build up after 30 seconds running, stop the engine and determine trouble.

Initial warm up should be at 1000 to 1200 RPM.

Engine is warm enough for take-off when the throttle can be opened without back-firing or skipping of the engine.

Check magnetos at 2000RPM. Drop-off should not exceed 125 RPM on either magneto.

Excercise propeller at 1500 RPM.

Cowl flaps should be open for all ground operation (pull handle out). Avoid prolonged ground operation as it will cause overheating. See Page 7 for Maximum Temperature Limitation).

For further information on cold weather starting and engine operation consult the Lycoming Operator's Manual.

C. OPERATION

TAKE-OFF Prior to take-off, a check should be made to insure that:

1. All occupants have properly secured the combination seat belt and shoulder harness.
2. Stabilator trim tab set.
3. Flaps are extended 30° or less for take-off.
4. Cowl flap lever is pulled out to fully open cowl flaps.
5. Propeller control is pushed in for maximum RPM.
6. Fuel selector valve is "ON".
7. Parking brake control is in "OFF" position.
8. If cross-wind gear lock is installed -- unlock.
9. If fixed gear is installed -- tailwheel locked.

C. OPERATION (Cont'd)

Best rate of climb is obtained at 60 mph IAS flaps down, and at 80 mph IAS flaps up at M.C. power. A cylinder head temperature gauge is provided as standard equipment, and power, cowl flaps, and speed settings should be selected to maintain the cylinder head temperature somewhat less than 500°F. The maximum permissible is 500°F at cruise power. Maximum T.O. power is maximum continous power.

LANDING During the let down prior to the landing approach:

1. Close cowl flaps so that the engine does not become cool.
2. Open throttle occasionally to clear out engine and keep warm.
3. Apply carburetor heat.

Prior to turning into the base leg in the landing approach:

1. Extend the flaps to the full down position, 40° manximum (Maximum flap speed is 70 mph).
2. Set propeller control to Full increase RPM
3. Check slat operation by slowing to approximately 55 mph.

CAUTION

High rates of descent occur at minimum speeds obtainable and it is advisable when making power-off approaches to maintain at least 65 mph IAS. Power approaches may be made at minimum airspeed if desired for minimum landing run.

This airplane may be equipped with Goodyear Corsswind wheels to facilitate crosswind landings when necessary. Usually it is possible to land directly into the wind because of the very short landing run required.

TAXI

1. Retract flap
2. Open cowl flaps

STOPPING ENGINE

1. Pull mixture control full out to the idle cut-off position.
2. After the engine stops, shut off the ignition switch and then the master switch.
3. Leave fuel valve in the "ON" position.

D. GENERAL OPERATING INSTRUCTIONS AND LIMITATIONS

This airplane is licensed in the normal category and no aerobatic maneuvers, including spins, are approved.

PROPELLER LIMITATIONS None

Avoid high engine speed (2100 rpm or higher) in combination with low manifold pressure operation (under 15"). Avoid rapid closing or opening of the throttle (especially from a high RPM and manifold pressure condition).

STALLS AND SPINS The leading edge slat and the restricted motion of the stabilator makes it impossible to fully stall the wing on the Courier II. As the minimum speed obtainable is approached with the yoke full back, a center section separation causes tail buffeting. A slight aileron nibble is also noticed as the minimum speed is approached. Minimum speed power-off with the flaps down is approximately 40 MPH IAS. Voluntary spins are prohibited.

D. GENERAL OPERATION INSTRUCTIONS AND LIMITATIONS (Cont'd)

STALLS AND SPINS (Cont'd)

Although the airplane can be forced, under certain conditions, into auto-rotation - which is technically a spin -- this maneuver is not the same as the well known "tailspin" in that it cannot occur accidentally and contrary to the pilot's movement of the controls. No dive nor forward movement of the control wheel is required for recovery. Recovery is effected by normal use of either the aileron or rudder control.

SPEED LIMITATIONS

The Never-Exceed Speed for the Courier II is 189 MPH C.A.S. A red line appears on the airspeed instrument at this speed. MAXIMUM FLAP SPEED IS 70 MPH C.A.S. The white range on the airspeed indicator indicates the flap range. Cruising range is marked on the airspeed indicator by a green arc, which extends to the maximum structural cruising speed, 150 MPH. In very gusty and bumpy air, the speed should be reduced to 95 MPH C.A.S., Flaps Up. This speed is known as the "maneuvering"speed.

FUEL SYSTEM

The Marvel MH-4-5 carburetor should be operated at.5 to 8 psi in accordance with manufacturer's recommendations.

ENGINE OPERATION

Complete operating instructions covering the care and use of the Lycoming engine are provided with each airplane and should be used as a guide in selecting power settings. These instructions are in the form of the Lycoming Operator's Manual.

FUEL

Use fuel with 100 octane rating.

OIL

Oil Grade	Oil Temperature	Desired	Maximum
Above 60°F (15°C).....SAE 50	SAE 50.....180°F (82°C)		245°F (118°C)
30° to 90°F (-1° to 32°C)..SAE 40	SERVO.....180°F (82°C)		245°F (118°C)
0° to 70°F (-12° to 21°C)..SAE 30	SAE 30.....170°F (77°C)		220°F (104°C)
Below 10°F (-12°C).....SAE 20	SAE 20.....160°F (71°C)		200°F (93°C)

ROTATING BEACON LIGHT

If beacon light is installed, this light should be turned off before entering overcast, as reflections from the rotating anti-collision light on clouds or dense haze can produce optical illusions and severe vertigo. This is particularly true at night.

PILOT'S CHECK LIST

BEFORE STARTING ENGINE

1. Brakes - Set
2. Switches - Off
3. Throttle - Cracked
4. Propeller - Full Inc. RPM
5. Mixture - Full Rich
6. Carburetor Heat - Cold
7. Cowl Flaps - Open
8. Fuel Valve - Open
9. Check trim-tab travel through entire range.

STARTING ENGINE

1. Master Switch - On
2. Ignition - Both
3. Aux. fuel pump - Switch "OFF"
4. Prime - as required
5. Clear outside
6. Ignition switch turned extreme right and push
7. Mag Switch to "BOTH" (Note oil pressure rise to operating range).
8. Warm up engine @1000 to 1200 RPM (idle @600RPM).

BEFORE TAKE-OFF

1. Controls - Free - Full Travel
2. Instruments - Alt. set - (Flight & Eng.) Bank & Turn Circuit Breaker - IN
3. Fuel Quantity (left and right tanks should be same quantity)
4. Flaps - as desired
5. Trim Tab set
6. Prop -- Full increase RPM
7. Mixture - Full rich
8. Carburetor air heat -- cold
9. Engine Run-up
   a. Check mags 2000 RPM (Max. permissible drop 125 RPM)
   b. Exercise prop - 1500 RPM
      Pull control to decrease RPM and note drop to at least 1000 RPM
   c. Full throttle check - 2575 RPM 27" Hg manifold pressure (at sea level)
10. Electric fuel pumps - as desired
11. Safety belt and shoulder harness
12. Check traffic

TAKE-OFF

1. Cowl flaps - open
2. Propeller - low pitch (high RPM)
3. Full Throttle

INITIAL CLIMB

1. Set power as required (Max takeoff power is Maximum Continuous)
2. Raise flaps
3. Aux. pump as desired
4. Observe cylinder head temperature (500°F Max.)

CRUISE

1. Throttle - 24" M.P.
2. Propeller - 2400 RPM
3. Cowl Doors - Closed (Except during continued slow flight)

BEFORE LANDING

1. Safety belts - tighten
2. Carburetor Heat - Hot
3. Mixture - Rich
4. Propeller - 2575 RPM (Full increase RPM)
5. Instruments - check
6. Wing Flaps - as desired
7. Cross-wind gear - as desired
8. Landing Light switch -- as desired

AFTER LANDING

1. Cowl Flaps - open
2. Wing Flaps - up (for taxiing)

ENGINE SHUT DOWN

1. Engine head temperature - Cool to at least 400°F
2. Throttle - 600 RPM (idle)
3. Propeller - Full low pitch (high RPM)
4. Mixture - Idle cut-off
5. All switches - OFF
6. Fuel Valve - ON

3. SUMMARY OF OPERATIONAL AIRSPEEDS AT GROSS WEIGHT - 3400 lbs.

* Minimum Speed - Power Off:

Flaps Up: 60 MPH C.A.S.
Flaps Down: 50 MPH C.A.S.

* Minimum Speed - Power On:

Flaps Up: 40 MPH C.A.S.
Flaps Down: 35 MPH C.A.S.

Never exceed speed: 189 MPH C.A.S.

Maximum Flap Speed: 70 MPH C.A.S.

Landing light may be extended at any speed throughout the normal operating range of the airplane.

* Minimum speeds are given because it is not possible to fully stall the airplane.

F. TAKE OFF AND LANDING TECHNIQUES

Most pilots new to the Courier do tend to raise the tail too high and let it run too long before pulling it off the ground, Then quickly learn from experience how soon the ship may be lifted off. For minimum take-offs, apparently nothing is gained by running the engine up to full-power with the brakes locked; in fact, the propeller slipstream tends to hold the right inboard slat shut and if the airplane is pulled off the ground a little too quickly before its forward motion has resulted in the slat opening, the take-off is actually impaired a bit and the ship will probably feel a bit right-wing heavy until a little more speed is picked up and the right inboard slat suddenly pops out. Apart from these minor comments, there is little regarding the take-off technique that calls for special comment.

LANDING - FULL FLAPS

The full-flap,power-off landing involves slightly different control responses and handling techniques than the average pilot has experienced. The Courier has about three times as much effective flap as the next most heavily flapped wing that the pilot has probably flown before. The pilot must understand the value of this larger flap and learn to use it properly thereby getting the full benefit of its added lift and short field capabilities.

LANDING - HALF FLAPS

Start our using "normal" aiplane configuration, namely, half flaps. When the Courier is flown at half flaps, it handles very much like other conventional airplanes equipped with high-lift flaps. However, even if it is flown with half flaps, it still has outstanding short field characteristics. After a landing or two in the half-flap configuration, he has then prepared himself to begin to take advantage of the full performance range of the Courier.

With half-flaps, an approach speed of 65 miles an hour is generally desirable when a pilot new to this airplane is becoming accustomed to the flare out and handling characteristics. When more experienced, the pilot may feel comfortable using speeds below 60 miles an hour with half flaps, but this is not to be advised at the outset. When coming in at this speed, the pilot should be reminded that the slats will pop out just as he begins his flare out and that they will have no effect whatsoever upon the controlability or balance of the airplane. A somewhat smoother technique is to let the slats pop out while still several hundred feet in the air by slowing the ship down to approximately 60 MPH and then keeping it in the 60 - 65 speed range so that the slats will just barely stay out during the glide. With half flaps at 60 mph, however, the plane has little "float" and should be flared out fairly close to the ground so that it will not developetoo much of a rate of sink before touching down.

Before proceeding to the full-flap landing, the pilot should realize the fact that when the lift of the wing is approximately doubled by the use of a flap, the drag is increased approximately fourfold. This high drag at the full-flap position not only produces a very steep rate of descent but also means that the airplane will have very little "float" once the nose is raised for flare out. Consequently, in a full-flap, no-power landing, the airplane should beheld in a nose down glide until about ten feet from the ground if the gliding speed is approximately 60 mph. If the gliding speed is higher or lower, the altitude for beginning the flare out can accordingly be higher or lower.

F. TAKE OFF AND LANDING TECHNIQUES (Cont's)

If, however, the ship is brought in at the relatively comfortable gliding speed of 50 mph power-off and a flare out is begun at the customary approximate thirty-foot altitude, speed will be lost very rapidly and the plane will develop a high rate of sink. The resulting impact is quite hard and may hurt the pilot's pride and confidence quite severely--though, surprisingly, seldom seems to bother the airplane. Fortunately, no matter how high the pilot levels out, the automatic slats eliminate all risk of rolling off into an uncontrolled stall or incipient spin.

The best way to approach the full-flap landing is to have the pilot pop out the slats by slowing the airplane down to 50 mph while still several hundred feet in the air. The best technique for slowing the airplane down, incidentally, is to crank the flaps half down (about 8 turns), starting at 70 mph. Then, when the airplane has slowed down to approximately 65 mph in half-flap condition, the flaps can be brought into full down position with very little effort. In general, it is advisable that the half-flap position and attendant normal airplane power-off gliding angle be maintained until the landing area is well "made"; that is, within easy short gliding range and with what seems to be a little extra altitude.

The easiest and generally approved technique for full-flap landings involves the maintenance of a little power-on, just sufficient to offset the added drag of the flaps and to produce a relatively normal airplane glide angle, thus maintaining the approach path to which most pilots are accustomed. This is accomplished by maintaining enough power-on to keep approximately eleven inches of "boost" on the manifold pressure gauge. The airplane is then flared out and landed in a perfectly normal manner, much the same as it would be with half-flaps, except that the approach speed has been at 50 mph instead of about 65 mph. The throttle should not be cut-off until the wheels have actually touched the ground.

Another advantage of the partial power approach is that it is very easy to control a glide path by slight increases or reductions in the amount of power during the approach. The airplane can be put on a pre-selected spot with great precision and surprisingly little skill once the idea of using the throttle for approach control is mastered. This is the type of approach taught Navy pilots for their carrier operations and is by far the best way to handle any airplane for small field and off-airport operations. It is the procedure recommended for day-in, day-out operation of the Courier.

LANDING - FULL FLAP - NO POWER

The full-flap, no-power landing, while not difficult, is really desirable only as an emergency procedure. In order to make smooth landings, it involves a slightly different technique with which all Courier pilots should be familiar. For full-flap, no-power landings, it is advisable that the pilot keep the approach speed a little above 65 mph until he becomes quite familiar with the airplane. The approach speed of approximately 65 mph should be maintained until the airplane is just off-the-deck. Prefereably, the entire flare out should be made within about ten to fifteen feet of the ground so that the nose barely comes up to the full landing position just as the airplane sinks down to the ground level. There is virtually no "float" to such full-flap, no-power landings, which is, of course, an important safety feature for emergency landings.

F. TAKE-OFF AND LANDING TECHNIQUES (Cont'd)

LANDING - EMERGENCY - POWER OFF

The generally recommended procedure for a power-off emergency landing, or for demonstrations of power-off landings at airports, is to use not more than half-flap for the initial approach. In still air conditions, the gliding angle of the airplane is then such as to give close to maximum range with the flaps half or a little less than half way down. (If the ship is gliding into the wind, the higher forward speed of the no-flap glide will, of course, provide an even greater gliding range).

The objective in the power-off landing is to glide to within a few hundred feet horizontally of the desired landing spot in a half-flap condition with perhaps fifty to a hundred feet more altitude than appears necessary to reach the spot with a normal half-flap gliding angle. By thus trying to come in a bit high, if the pilot underestimates the distance, he can continue to glide up closer before putting down full flap. Otherwise, he can start cranking down to full-flap position as soon as he is positive that he has the spot within the steep gliding angle of the full-flap final approach. If he has overshot a bit, the nose can be put down quite rapidly without picking up excess speed. When the nose is pulled back up, the ship will then settle onto the ground with surprisingly little "float". Once the technique is understood and practiced a few times, worries about forced landings diminish and the pilot begins to appreciate the extra safety and unusual advantages that the Courier afford him.

MINIMUM FLIGHT SPEEDS - POWER ON

The minimum flight speeds with flaps is 35 mph and without flaps is 40 mph.

SECTION III - OPERATION AND MAINTENANCE OF SYSTEMS

A. FLIGHT CONTROL SYSTEMS

*1. The aileron-interceptor system is actuated by dual control wheels and a series of cables, pulleys, bellcrank and pushrods to the control surfaces. The dual wheels are synchronized through a chain and sprocket arrangement mounted to the control yoke. The system is accessible by removing the covers mounted to the diagonal members forward of the front door post and on the diagonal member of the co-pilot's side. Removal of the inspection cover in the ceiling just above the front seat gives access to the turnbuckles and the removal of the wing inspection covers provides access to the remainder of the system.

The stops for the restriction of travel are located on the aileron bellcrank support in the wings at the front spar forward of the ailerons.

The interceptor system is a part of the aileron system. It is made up of curved metal blades, actuated by a push-rod connected to the aileron bellcrank through a series of arms and atorque tube. This system's primary function is to provide lateral control during slow flight operation. The blades should be approximately 3/8 plus or minus 1/16" below the wing surface and they should be set up in this position when the ailerons are in "level flight" position.

This measurement may be made by resting a scale on the blade edge along the interceptor span. The system does not require lubrication.

To obtain proper hinge moment, the amount of spoiler chord on the tip side of the trailing edge of the aileron varies with the number of interceptor blades installed.

AILERON REMOVAL

A. Remove the outboard wing leading edge inspection covers just forward of the aileron, then remove the bolt that attaches the push-rod to the bellcrank. BE SURE TO RETAIN ALL WASHERS INCORPORATED.

B. Remove the two inspection covers at each end of the aileron. The two center covers need not be removed at this time.

C. Remove the inspection covers from the wing tip and the cover next to the aileron on the wind panel. This given access to the aileron attachment bolts.

D. Remove bolts and retain washers. They are used to position the aileron to the wing.

E. Remove the aileron.

F. To remove the pushrod from the aileron, remove the two inspection covers remaining on the aileron. Remove the attaching bolt, being sure to retain all washers; IN THIS CASE, TWO ON EITHER SIDE OF PUSHROD.

G. Reverse this procedure for installation

* Dual controls are optional equipment

A. FLIGHT CONTROL SYSTEMS (Cont'd)

1. AILERON AND INTERCEPTOR CONTROL SYSTEM (Cont'd)

INTERCEPTOR ADJUSTMENT

a. Remove the bolt which retains the push rod to the bellcrank.

b. Turn the rod end until the desired static position is obtained.

c. Resafety the rod end and replace the pushrod to the bellcrank.

NOTE: When repairing or repainting an aileron, the maximum static unbalance permitted about the hinge line is 3.50" lbs.

2. RUDDER CONTROL SYSTEM

The rudder control system is made up of a torque tube assembly, (which synchronizes the pilot and co-pilots rudder pedals) and a series of pulleys and flexible control cables. The torque tube assembly is accessible by removing the floor boards just aft of the firewall. The remainder of the system may be reached by removing the remaining floor boards, the baggage compartment bulkhead and the inspection covers at the rear of the airplane directly under the stabilator. The only lubrication necessary in this system is the torque tube assembly which is lubricated with AN-G-5 general purpose grease. The grease fittings are provided, on the torque tube assembly. The pulleys and the remainder of the system are provided with sealed bearings and need no further lubrication. A rudder stop is provided at the rudder horn. The rudder is equipped with a ground adjustable trim tab -- the pilot's rudder pedals have four position adjustments for the convenience of the pilot. See page 16 for diagram of rudder control system.

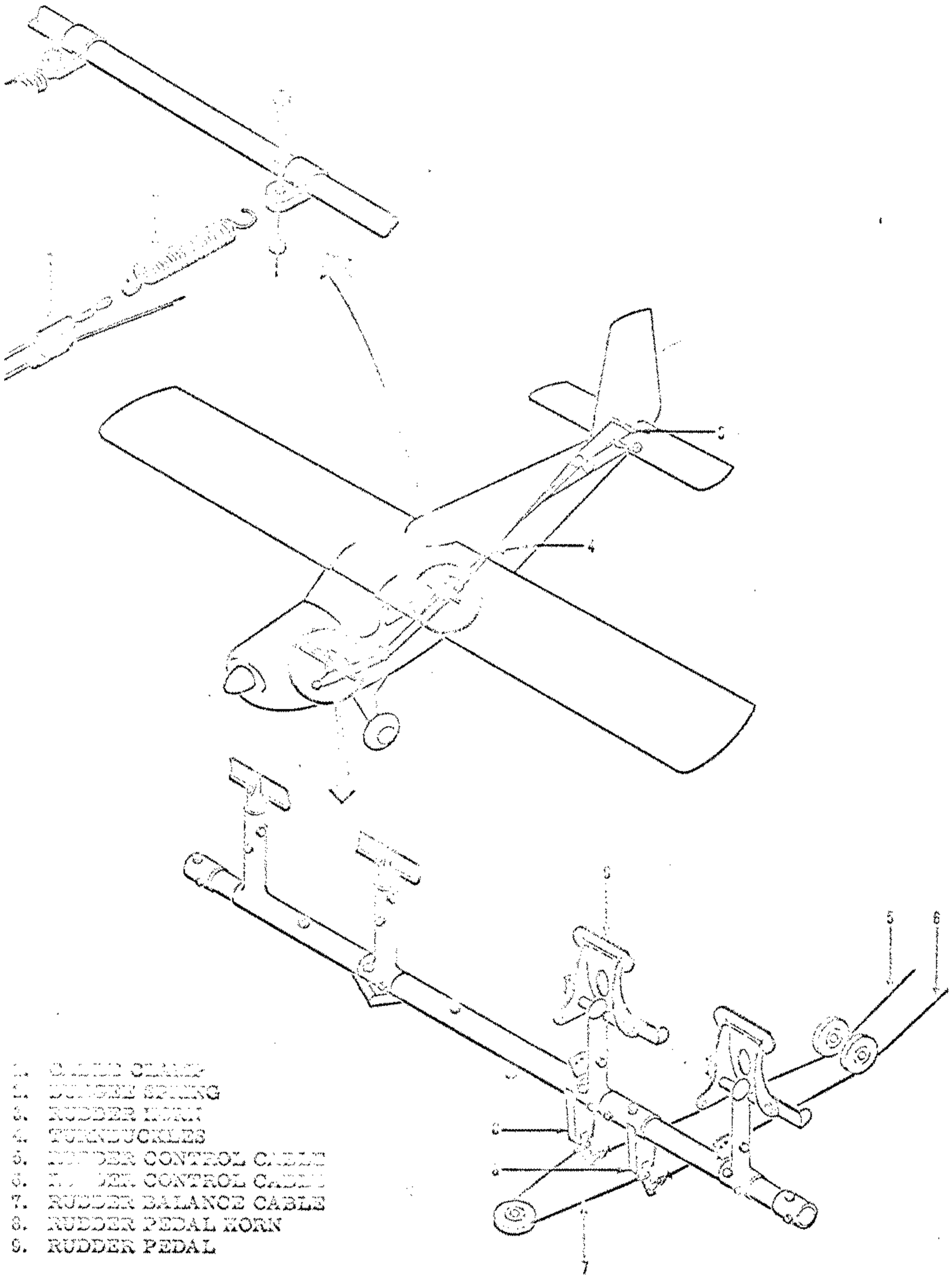
RUDDER REMOVAL

a. Release the tension from cables by loosening the turnbuckle.
b. Disconnect the cables from the rudder horn.
c. Remove the running light wire.
d. Remove the lower attachment bolt, being sure to retain the washers.
e. Remove the top and center attachment bolts.
f. Remove the rudder.
g. Reverse this procedure for installation.

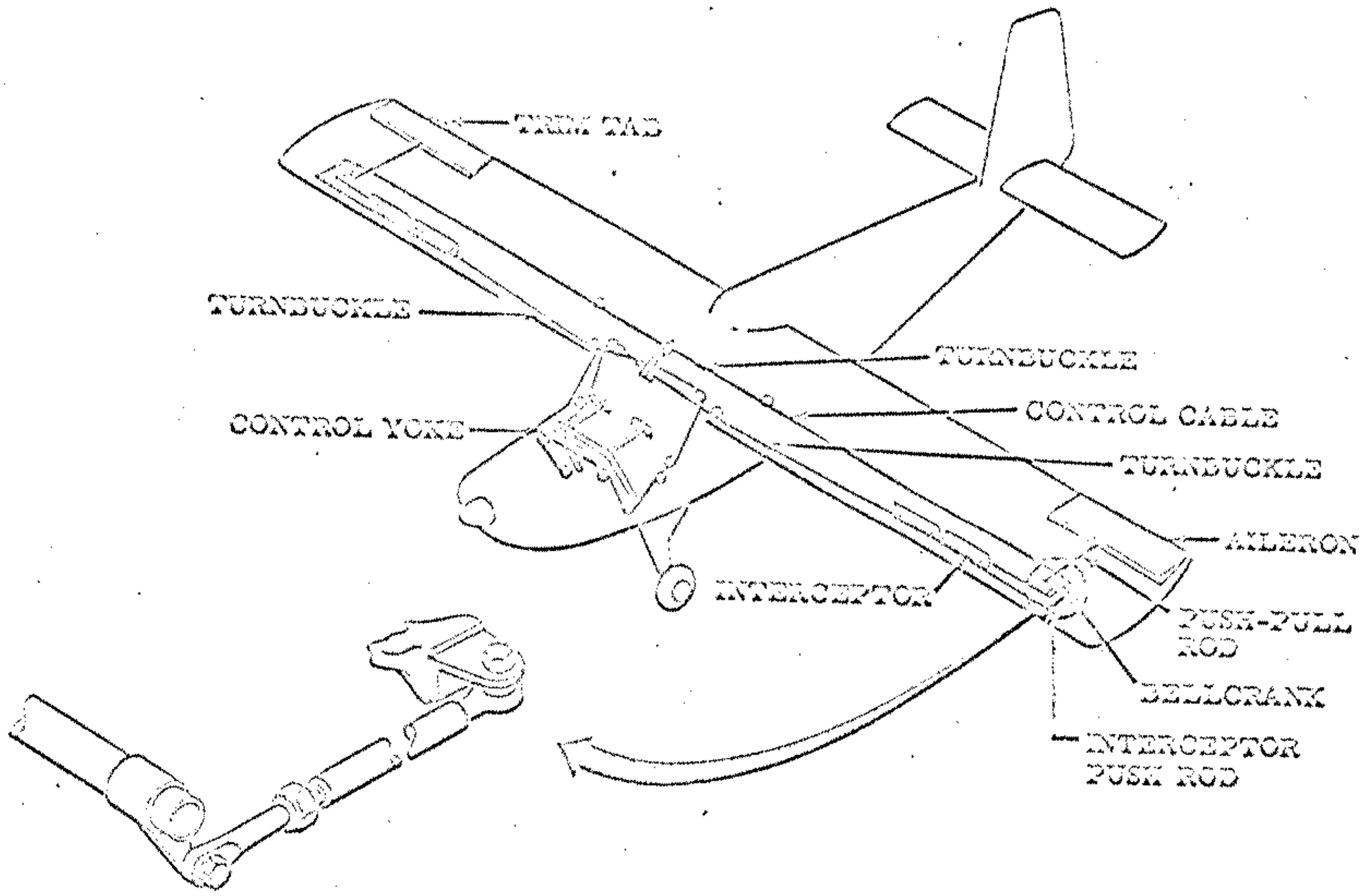
NOTE: When repairing the rudder, the maximum permitted static unbalance about the hinge line is 4.50" lbs.

3. STABILATOR CONTROL SYSTEM

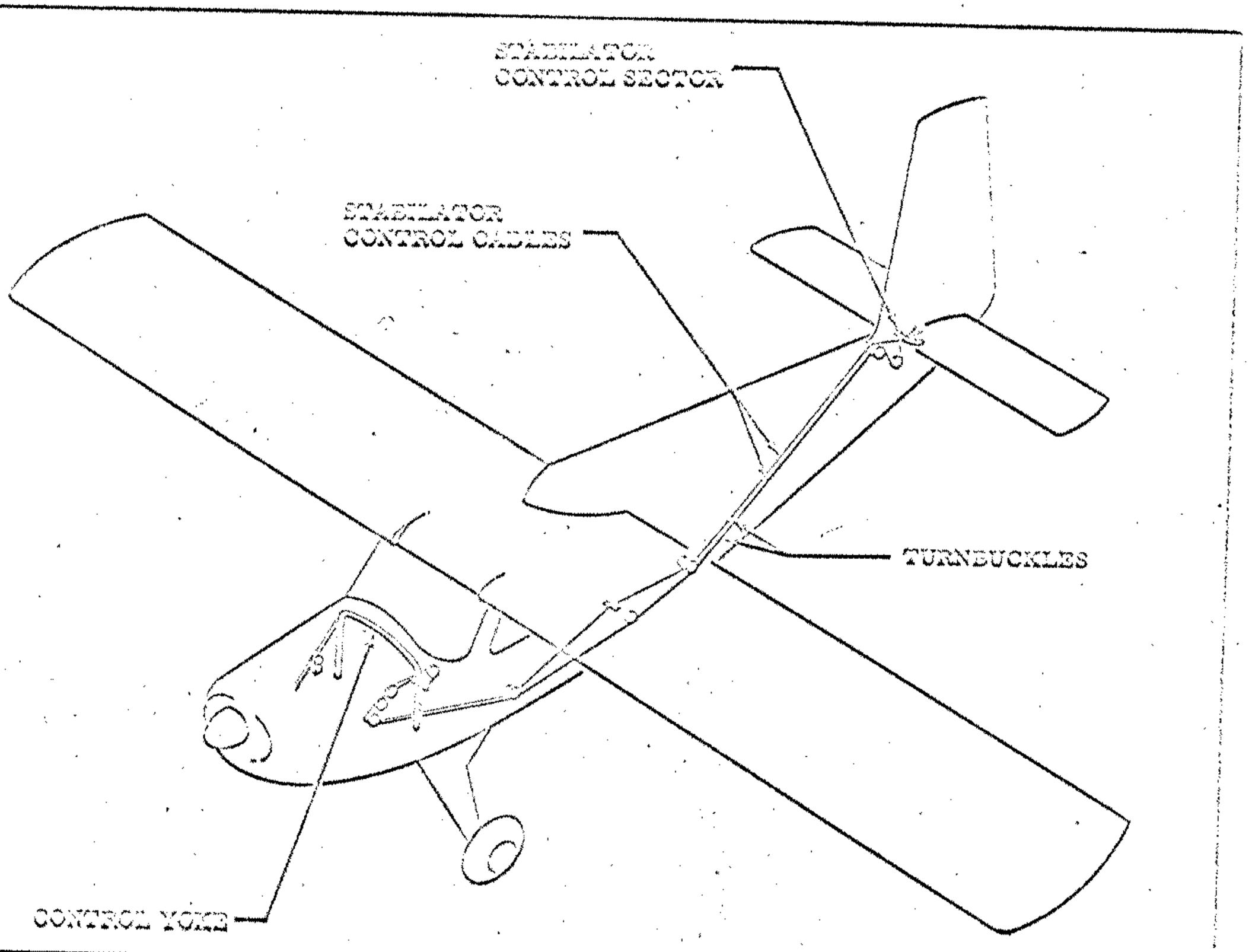
The stabilator is a one-piece all movable surface and is actuated through a control yoke assembly, flexible control cables and pulleys to a sector connected to the stabilator surface. There are no adjustments necessary on this system as all stops are pre-set at the factory. Accessibility to the system is acquired by removing the cockpit floor boards, baggage compartment bulkhead and the inspection covers just below the stabilator. See page 17 for diagram of stabilator control system.



Rudder Control System



Aileron Interceptor Control System



Stabilator Control System

A. FLIGHT CONTROL SYSTEMS (Cont'd)

3. STABILATOR CONTROL SYSTEM (Cont'd)

In order to remove the stabilator from the airplane, the vertical fin and rudder must first be removed. The stabilator is hinged to the forward spar of the vertical fin and may be removed as follows:

STABILATOR REMOVAL

A. Disconnect the rudder cable and running light wire and remove the rudder.

B. Disconnect the anti-balance tab pivot and trim tab controls.

C. Disconnect the stabilator attachment bolts (AN3524-11) which attach the stabilator to the vertical fin, permitting the stabilator to rest on the fuselage longerons.

D. Remove the vertical fin from airplane.

E. Disconnect the cables from the stabilator control sector and carefully remove the stabilator from the airplane.

F. Reverse this procedure for installation.

No lubrication is required in this system because of the use of sealed ball bearings.

NOTE: When repairing the stabilator, the maximum permitted static unbalance is 80.0" lbs.

4. STABILATOR TRIM TAB AND ANTI-BALANCE TAB CONTROL SYSTEM

The stabilator trim tab is an auxiliary control surface located on the trailing edge of the left half of the stabilator and is actuated through a system of cables, pulleys, and a flexible push-pull control. The tab is controlled by rotating the tab control crank located above and to the right of the pilot's head. The tab indicator is located just forward of the control crank. COUNTER CLOCKWISE ROTATION FOR NOSE UP CONDITION AND CLOCKWISE FOR NOSE DOWN.

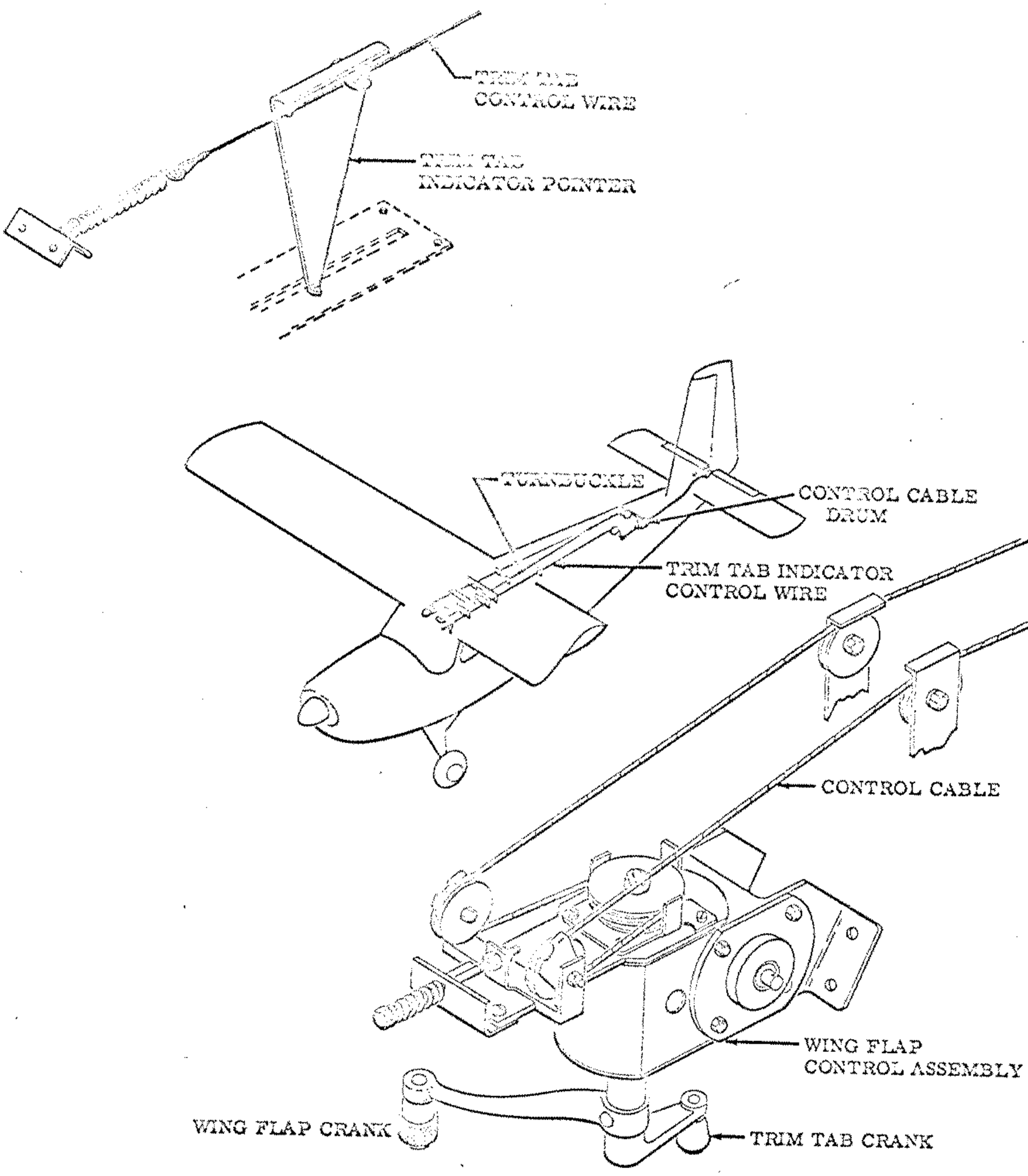
The stops incorporated in this system have been set at the factory and need no further adjustment.

The anti-balance tab is located on the trailing edge of the right side of the stabilator and is operated automatically by the movement of the stabilator. No adjustment is necessary in this system.

NOTE: The total free play of the trim or anti-balance tab should not exceed a total of 1/10 of an inch at the trailing edge. This play should be checked periodically.

5. SLAT SYSTEM

The slat system is contained entirely within the wing panel. Since the slats operate automatically, there are no cockpit controls. The system contains four independent slats - each with it's own mechanism, consisting



Stabilator Trim Tab Control System

A. FLIGHT CONTROL SYSTEMS (Cont'd)

5. SLAT SYSTEM (Cont'd)

of torque tube, arms, links and slat support tubes. To inspect and service the system, remove the eight inspection covers on the underside leading edge of the wing panels. Check each slat for freedom of operation by grasping the leading edge and moving the slat in and out of the wing. Little or no maintenance is required to keep this system in operation and lubrication has been eliminated by the use of nylon and sealed guide roll bearings. If for any reason the slats are removed, be sure that the washer spacers between the slat support tube and the slat proper are retained, as these washers are necessary for proper fit of slat to wing.

6. FLAP SYSTEM

The flaps are operated by a control crank through a series of gears, screws, pushrods and bellcranks to the surfaces. The control crank is located above and to the right of the pilot. Accessibility to the system required removal of the inspection cover in the ceiling above the front seat and the removal of the wing leading edge inspection covers.

By rotation of the crank the flaps may be set in any position from 0 to 40°.

This system needs no lubrication as all bearings are either nylon or sealed ball bearings. See page 22 for diagram of flap control system.

FLAP REMOVAL

a. Remove the two bolts which attach the two pushrods to the flap proper. There are two pushrods per flap.

b. Remove the six bolts that retain the flap track bearings. BE SURE TO RETAIN ALL WASHERS AND SPACERS AS THEY ARE USED TO LOCATE THE FLAP PROPERLY. Remove flap.

c. Reinstall by reversing the above procedure.

FLAP TRAVEL ADJUSTMENT (Refer to Diagram on page 25)

UP TRAVEL (See page 21)

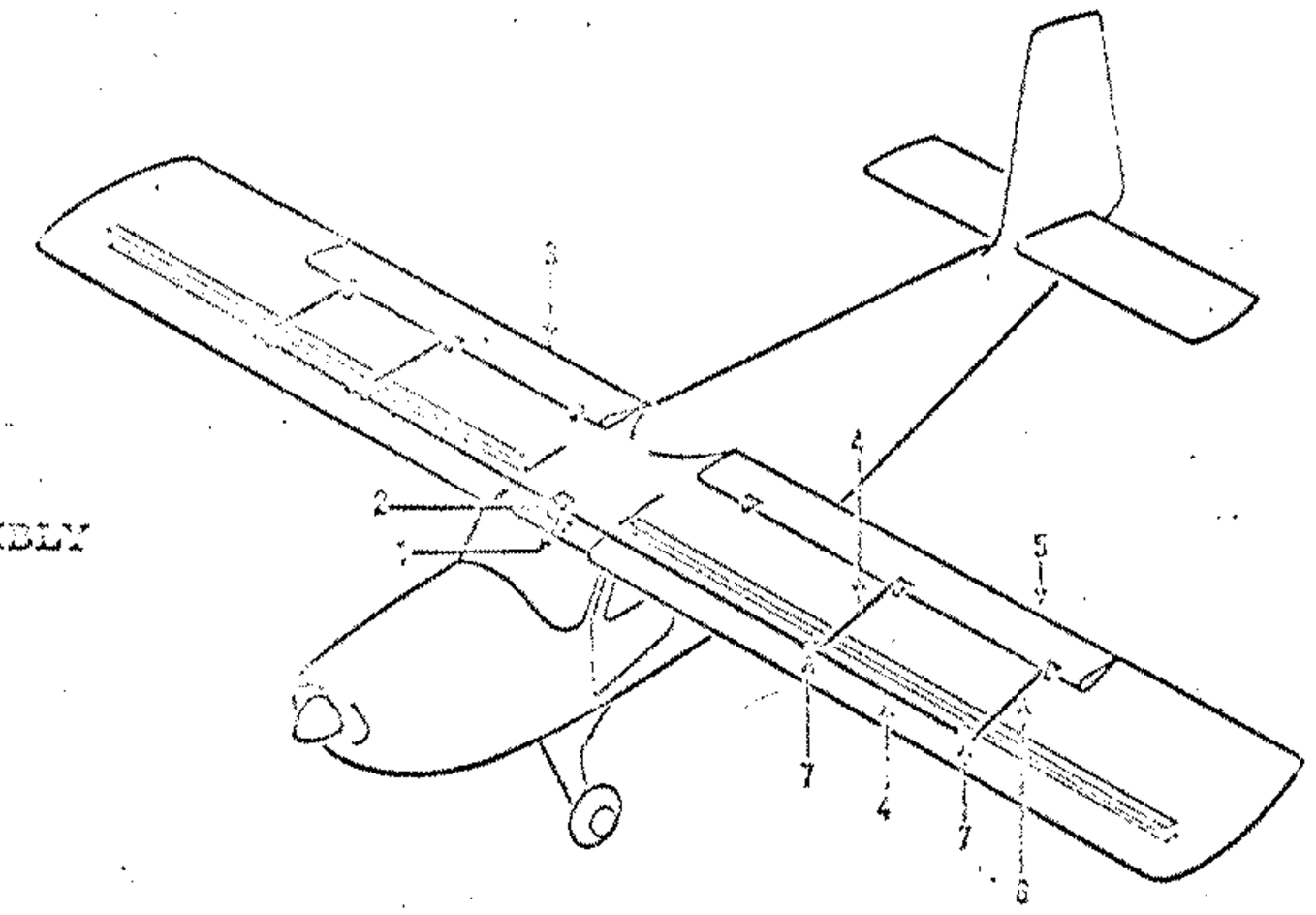
Crank the flaps to the UP position. Press out ROLLPIN #2. Turn STOP #1 in either direction, whichever is necessary for proper travel. Reinstall pin.

DOWN TRAVEL (See page 21)

a. Remove the ROLLPIN #4 which attaches UNIVERSAL #5 to flap control mechanism.

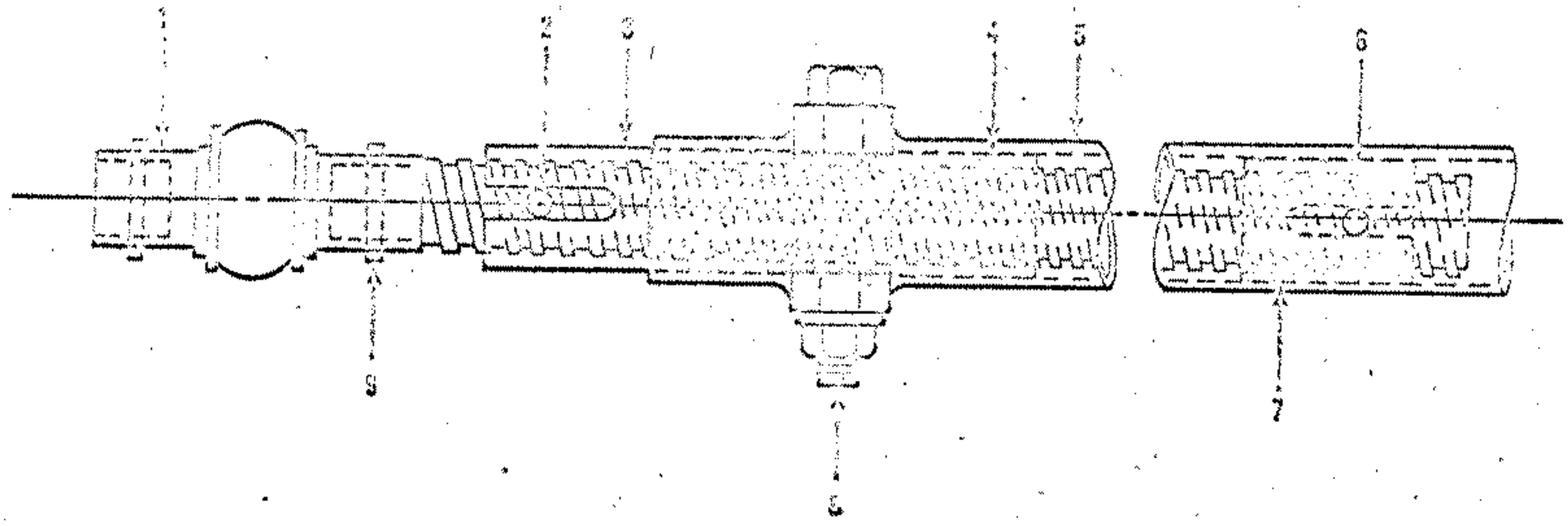
b. Remove the two BOLTS #7 which retain SLEEVE #3 to the pushpull tube proper. Slide the screw unit out of the tube; this will give access to the down stop on the other end of the actuating screw.

c. Press out ROLLPIN #6 and turn stop in either direction, whichever is necessary for proper adjustment.



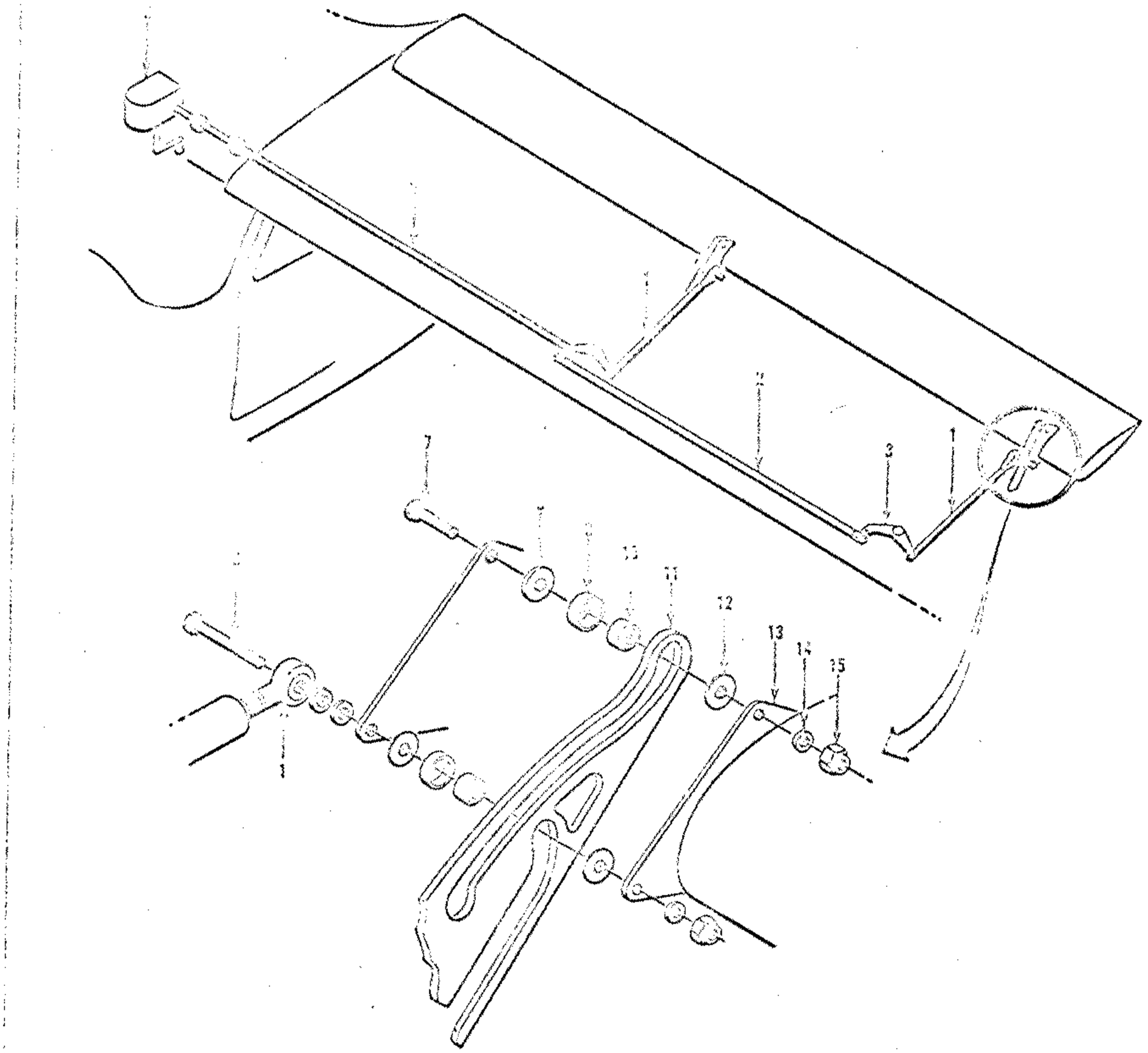
1. WING FLAP CRANK
2. WING FLAP CONTROL ASSEMBLY
3. RIGHT WING FLAP
4. PUSH-PULL RODS
5. LEFT WING FLAP
6. PUSH-PULL ROD
7. BELLCRANK

Wing Flap Control



1. UNIVERSAL
2. ROLL PIN
3. STOP
4. SLEEVE
5. PUSH-PULL AND BLOCK ASSY.
6. ROLL PIN
7. STOP
8. BOLT
9. ROLL PIN

Wing Flap Jack Screw Rigging



1. WING FLAP TO BELLCRANK PUSH-PULL ROD
2. BELLCRANK TO BELLCRANK PUSH-PULL ROD
3. BELLCRANK
4. BELLCRANK TO JACK SCREW PUSH-PULL ROD
5. WING FLAP CONTROL ASSEMBLY
6. BOLT
7. BOLT
8. SPACER
9. BEARING HOUSING
10. BEARING
11. FLAP TRACK
12. SPACER
13. WASHER
14. NUT

Wing Flap Installation

A. FLIGHT CONTROL SYSTEMS (Cont'd)

6. FLAP SYSTEM (Cont'd)

FLAP TRAVEL (Cont'd)

d. Replace pin and reinstall the screw unit in the tube, being sure to line up the locking grooves in the SLEEVE #3 with the holes provided in the PUSH-PULL TUBE #8. This prevents rotation of the THREADED SLEEVE #3.

e. Reconnect the universal to the flap control unit.

7. CONTROL COLUMN INSTALLATION

A diagram provides information on the control column installation. The diagram (Detail "A" page 23a) shows the sprocket assembly. The yoke is attached to fuselage truss by AN bolts.

8. CONTROL SYSTEM MOVEMENTS AND CABLE RIGGING LOADS

Stabilator (Trailing edge)	Up 19°	Down 8°
Stabilator (Trim Tab)	Up 36°	Down 20°
Stabilator (Anti-balance Tab)	Up 36°	Down 20°
Ailerons	Up 20°	Down 20°

Interceptor:
The top edge 3/8, plus or minus 1/16" below surface of wing skin when ailerons are in level flight position.

Rudder:
Right 30°
Left 25°

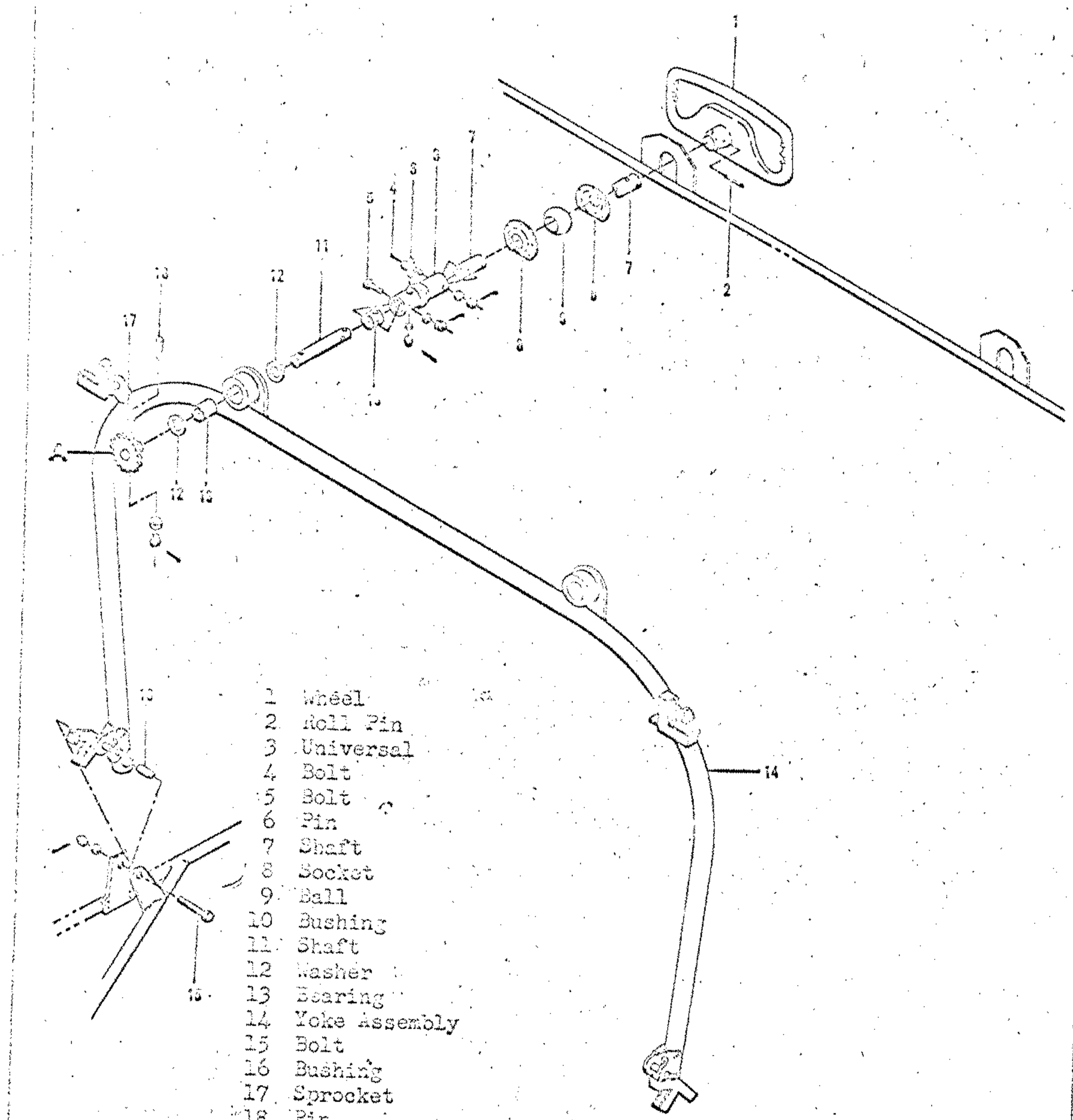
Flaps:
Down 40°

Tolerances on all angles in plus or minus 1°

CABLE LOADS

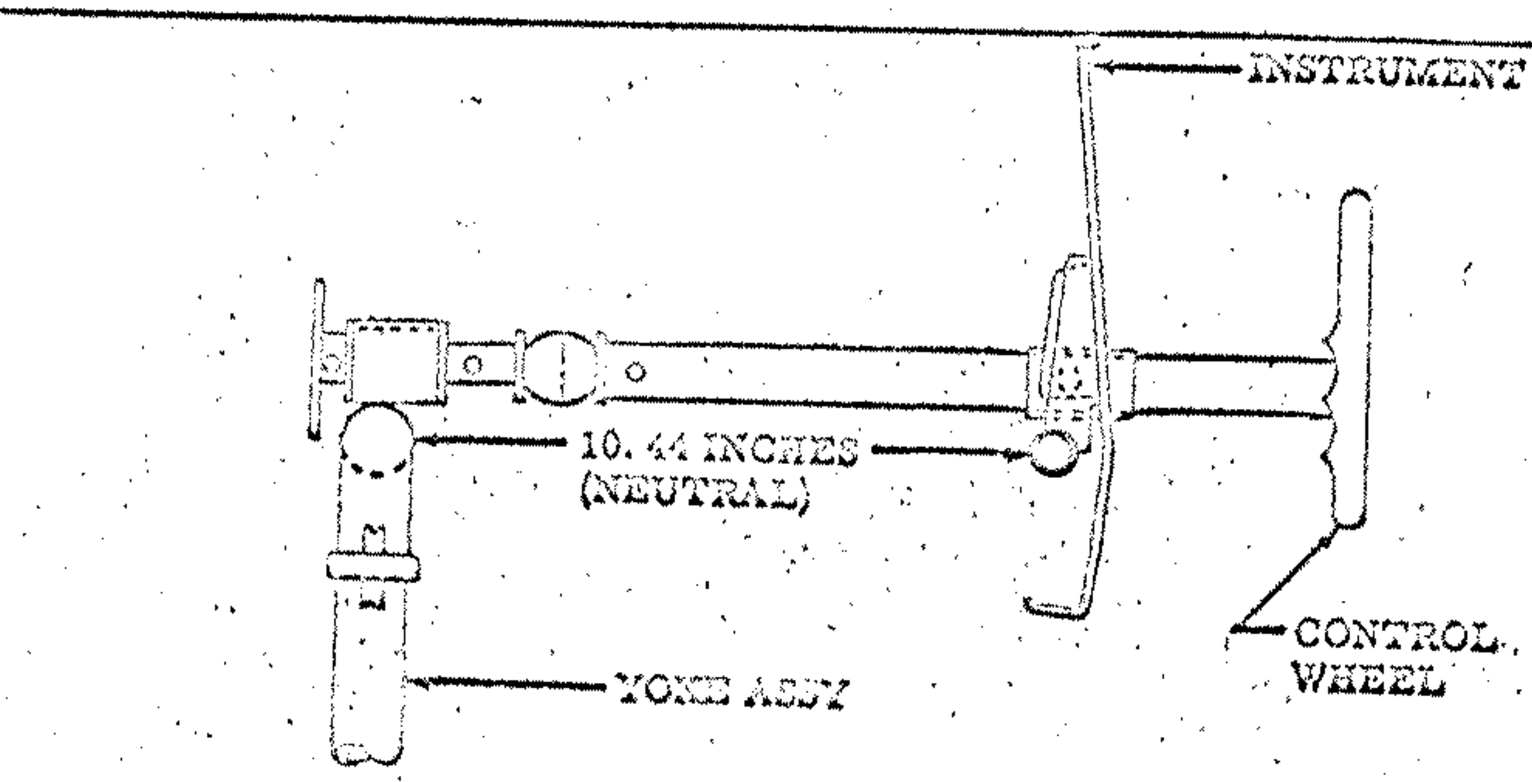
Stabilator 40, plus or minus 5 lbs.
Trim tabs 8 to 10 lbs.
Rudder 30 to 40 lbs., per-load tension

The neutral position of the stabilator is 2.5° (trailing edge down) as measured from the horizontal reference line. The horizontal reference is set up by the use of the leveling buttons which are located at the forward edge of the right hand door just inside the framework (See Sect. IV, para. E). The stabilator trim and anti-balance angles are measured from the chord line of the stabilator. Note that the anti-balance tab should be 36° up

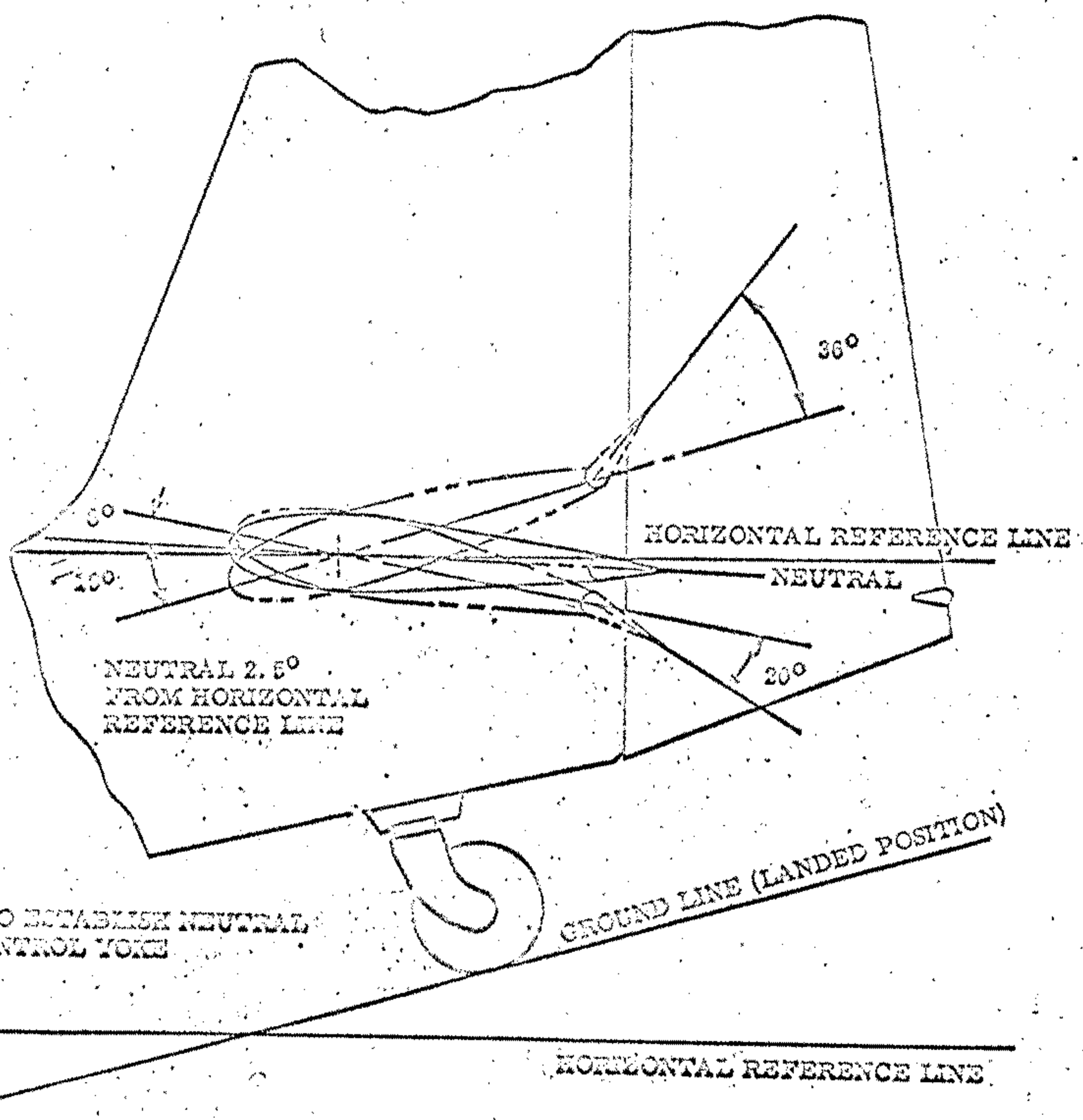


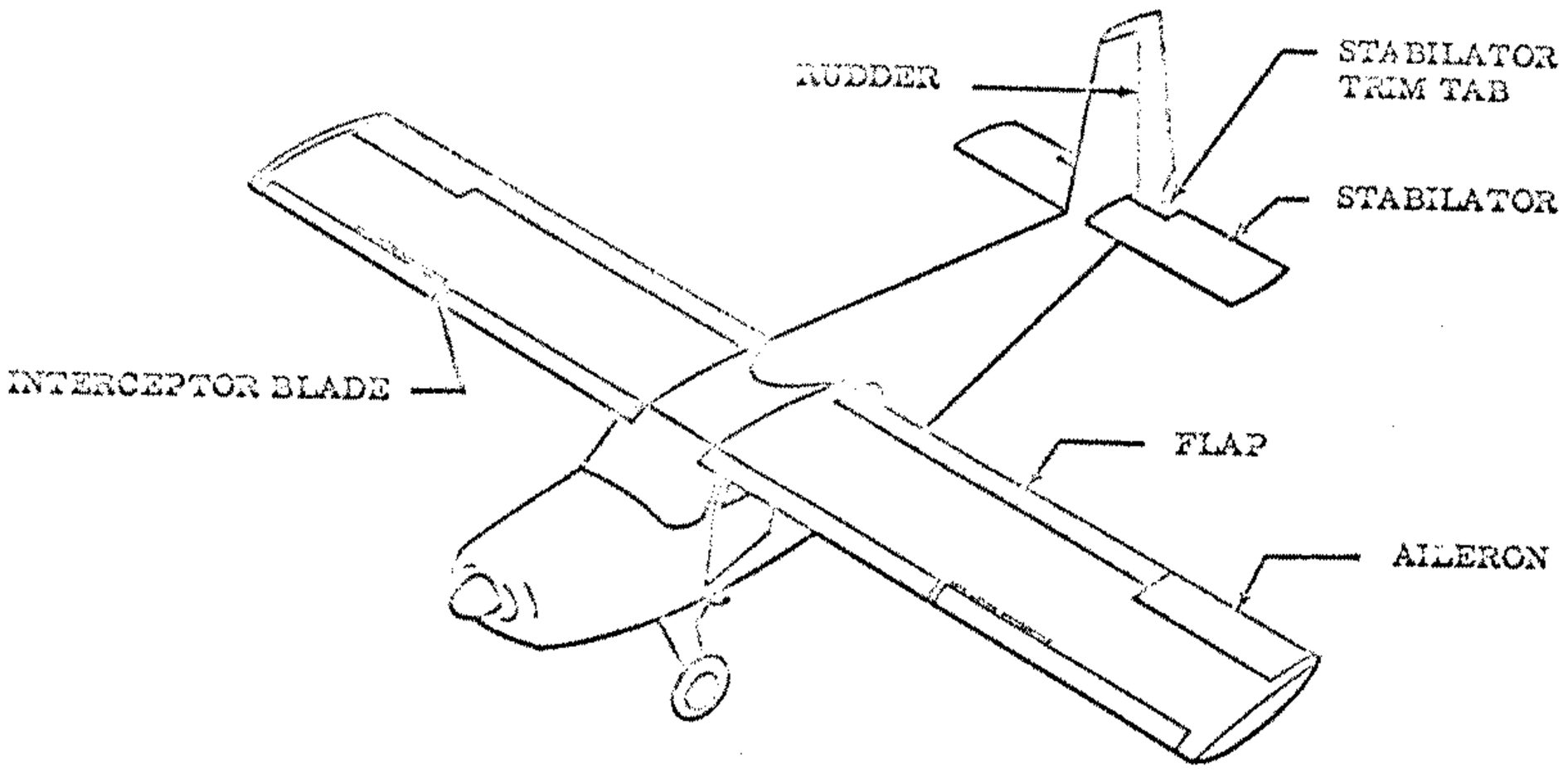
1 Wheel
2 Roll Pin
3 Universal
4 Bolt
5 Bolt
6 Pin
7 Shaft
8 Socket
9 Ball
10 Bushing
11 Shaft
12 Washer
13 Bearing
14 Yoke Assembly
15 Bolt
16 Bushing
17 Sprocket
18 Pin

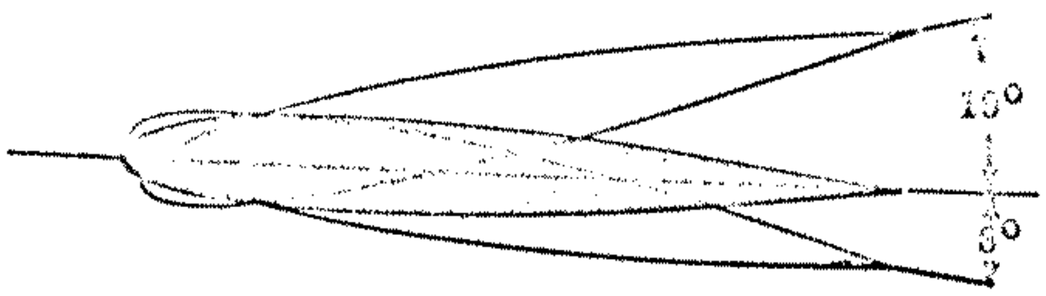
Control Column Installation



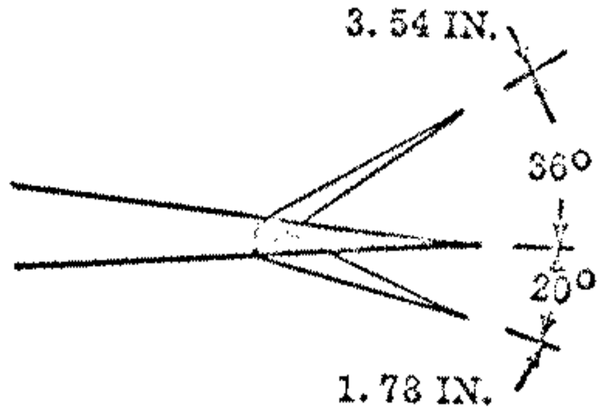
DETAIL A
CONTROL YOKE IN NEUTRAL POSITION



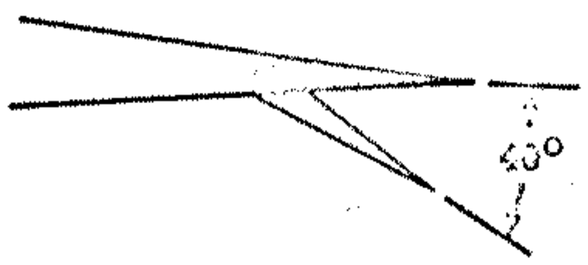




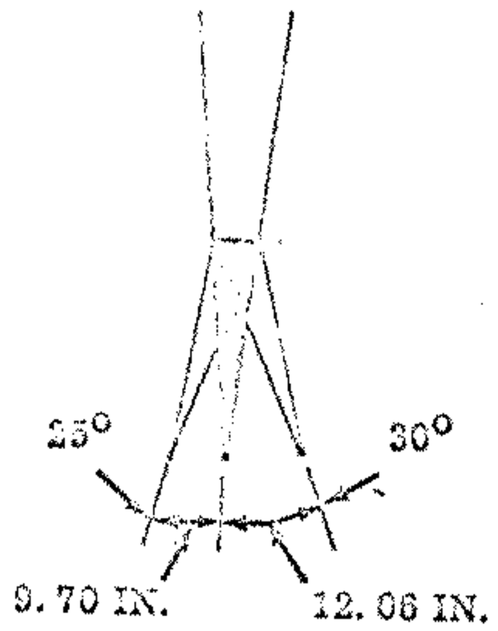
STABILATOR LIMITS



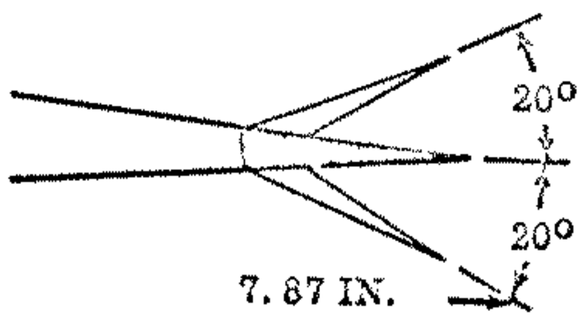
STABILATOR TRIM TAB LIMITS



FLAP LIMITS



RUDDER LIMITS MEASURED AT BOTTOM OF RUDDER



AILERON LIMITS

TOP OF INTERCEPTOR BLADE SHALL BE FLUSH WITH TOP WING SKIN WHEN AILERON IS RAISED 1 TO 1.5 INCHES FROM NEUTRAL AS MEASURED AT TRAILING EDGE OF AILERON

INTERCEPTOR FLUSH

Control Surface Travel Measurements

A. FLIGHT CONTROL SYSTEMS (Cont'd)

S. CONTROL SYSTEM MOVEMENTS AND CABLE RIGGING LOADS (Cont'd)

CABLE LOADS (Cont'd)

measured from the stabilator chord line when the stabilator is up 19° from the stabilator "neutral" position. The anti-balance tab should be down 20° when the stabilator is down 8°. The following sketches clarify the angular measurements. See page 24 for diagram showing relationships of trim and anti-balance tabs to the stabilator during extreme movements of stabilator. The diagram is shown with tabs in neutral position.

B. FUEL SYSTEM

The fuel system consists of the two fuel bladder cells, one located in each wing panel, one fuel shut-off valve, a fuel selector valve, one gascolator located under the right hand window, an engine driven fuel pump, and two electrically driven booster pumps, and a hand operated engine primer. The fuel quantity transmitters are of the float type and they are located on the inboard wing ribs. Each cell is filled through a filler neck which extends above the wing panel. The fuel cells are of the collapsible type. The system is suitable for aeromatic fuels.

The main fuel valve is located on the right side of the cockpit, below the forward window. There are only 2 positions, "ON" and "OFF". When "ON", the valve handle is horizontal. This valve controls the fuel flow from both wing tanks, which are interconnected.

The fuel filter is accessible for inspection and drainage from the outside of the plane through a small door located below the right forward window. A needle valve beside the fuel filter can be used to shut off the fuel from the tanks when the filter is to be removed for cleaning.

A cross-over line is used to give both tanks a common vent, located on top of the fuselage.

Usable fuel capacity of planes is 58.2 gallons.

The zero reading of the fuel indicators is calibrated for zero usable fuel. Although there is 2.5 gallons left in the system at zero indicator reading, it cannot be safely used in all attitudes of flight.

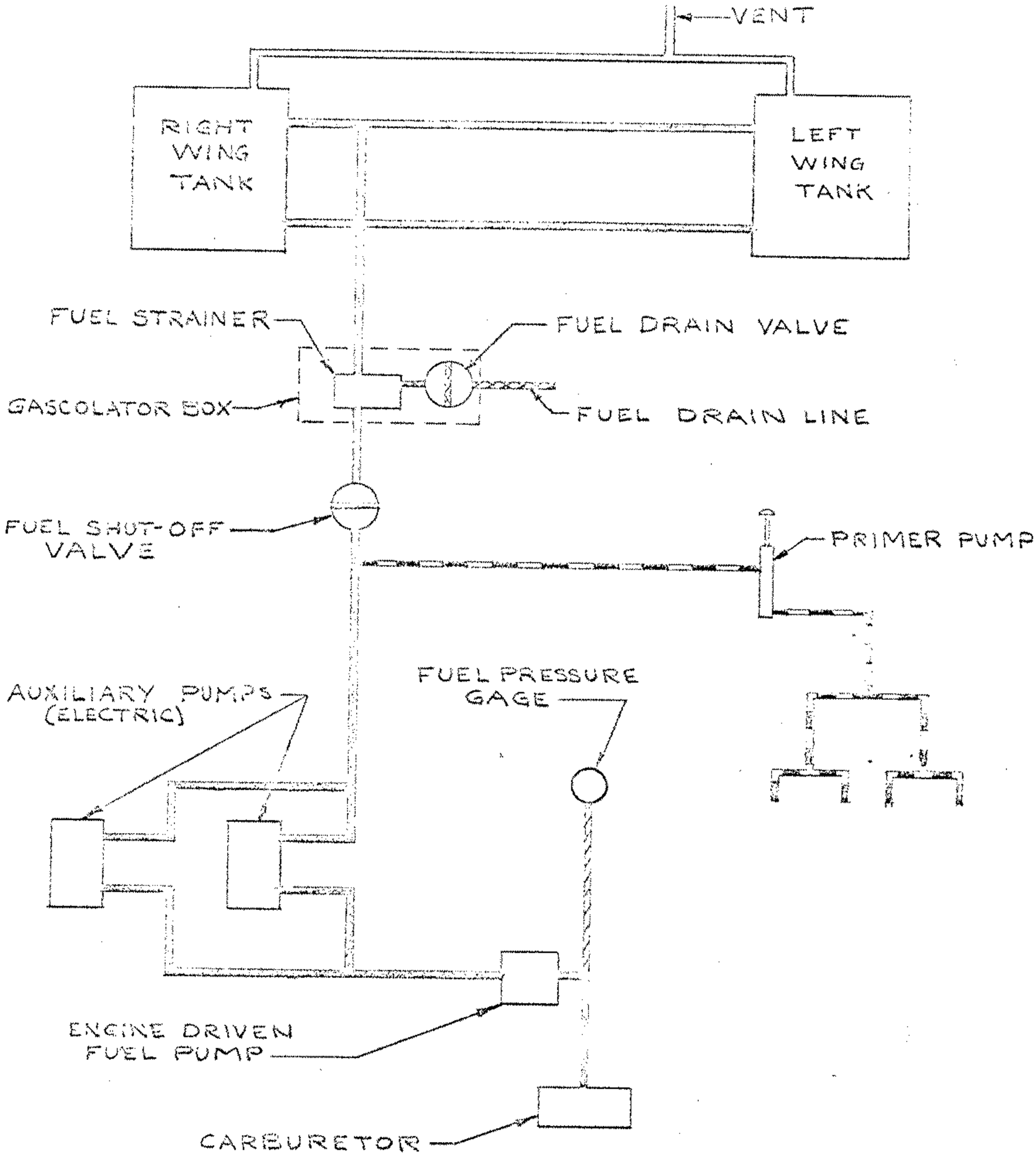
FUEL CELL REMOVAL

1. Drain the fuel system by opening the snap valve on the gascolator.

2. Remove the wing fairing strip, being sure to remove the fuel cell vent which is attached to the cell under the fairing strip.

3. Remove the trailing edge inspection covers and remove the hose clamps which retain the 90° elbow to the cell outlet. BE VERY CAREFUL WHEN REMOVING AS THIS ELBOW CONTAINS THE FINGER STRAINER.

4. Remove the fuel quantity indicator wire and indicator proper.



LEGEND

FUEL SUPPLY LINES

PRIMER LINES

VENT LINES

PRESSURE LINES

DRAIN LINES

HELIO AIRCRAFT CORP.

FUEL SYSTEM SCHEMATIC

FOR MODEL H-250 AIRCRAFT

B. FUEL SYSTEM (Cont'd)

FUEL CELL REMOVAL (Cont'd)

5. Remove the filler neck from the top of the tank. This is attached with AN502-416-10 fillister head machine screws.

6. Remove the lower fuel cell access door.

7. Remove the attaching AN502-416-12 fillister head machine screws which retain the lower fuel cell cover. Remove cover. Before removing cell, wipe or spray the entire interior with light engine oil, and let it soak for 24 hours.

8. Reach inside the oval opening to the top of the cell and locate the twelve cell attaching buttons. To release, slip a small piece of rubber hose over the end of each fitting. Push up, and at the same time, pull button aft until cell is released from the wing.

9. Roll the bladder cell up and remove it from the cavity through the oval opening being careful not to damage the cell.

10. Reverse this procedure for installation, except that the gaskets should be replaced at each cell removal. The following are the gasket part numbers (manufactured by U.S. Rubber Co., Mishawaka, Indiana).

	Gasket	Number	Qty. Req'd (per tank)
a.	Filler Neck	FCB27519	2
b.	Lower Access Opening	FCB25752	1
c.	Fuel Qty. Transmitter	FCB25750	1

See page 27 for a schematic diagram of the fuel system.

C. ELECTRICAL SYSTEM

See page 29 for electrical wiring schematic.

A twelve volt battery and an engine-driven generator supply electrical power for the single-wire electrical system. The battery and case are located on the left forward of the firewall. Power from the generator is fed to the electrical system through a voltage regulator which is limited to 20 amperes.*

The master switch must be in the "ON" position before operation of the electrical is possible.

Circuit breakers are installed to protect electrical components.

It is very important that the battery be properly filled at all times. Inspection of the liquid level in the battery should be made at approximately every 20 hours. The acid solution should be up to, never over, the baffle plate (protective sheet over plates) or not more than 1/4 inch above the separators. The use of an aircraft type of battery hydrometer will automatically fill to the proper height.

* Special installations 50 amperes

VOLTAGE REG. B A F
COND.
20
19
22
GEN SW.
GENERATOR
M
F
23
STARTER
16
GND. TO ENG.
18
AMMETER
9
10
STARTER SOLENOID
MASTER SOLENOID
12
A
2
3
1
7
5
MASTER SW.
B2
B1
R.H. MAG.
L.H. MAG.
P R L
L R
GND
BAT
B
10-126680-2 IGN SW.

TOTAL & SEP — 5A — 32 — GA — 33 — MS 3106B10-9L-3S(C) MS 3057-4B

INST. LIGHTS — 5A — A41 — A42

PANEL LIGHTS — 5A — A20 — A21 — A22 — R.H. PANEL LIGHT; A19 — A23 — L.H. PANEL LIGHT; 32446 KNIFE DISCONNECT

FUEL QTY L.H. — 5A — A30 — GA — A31 — A32 — FUEL TRANSMITTER

FUEL QTY R.H. — 5A — A25 — GA — A26 — A27 — FUEL TRANSMITTER

CARB AIR TEMP. — 5A — A65 — GA — A66 — A67 — A68 — T — THERMOCOUPLE BULB MS 3108A-12S-3S(C) MS 3057-4B; MS 3106A-14S-2S(C) MS 3057-6B

CYL HD. TEMP. — 5A — B3 — GA — B4 — T

OIL TEMP. — 5A — B5 — GA — B6 — T

FUEL PUMPS — A18 — A15 — 5A — A16 — Rt. FUEL PUMP; 5A — A17 — LT. FUEL PUMP

NAV. LIGHTS — 10A SW. — A13 — A14 — A35 — RT. WING LIGHT; A34 — A11 — RUDDER LIGHT; A7 — A8 — A36 — LEFT WING LIGHT

ANTI-COL LIGHTS — 5A SW. — C3 — C2 — C4 — 32446 KNIFE DISCONNECT

PITOT HEAT — 10A SW. — 48 — 49 — 50

INSTR. CLUSTER — COMPASS LIGHT

RIM LIGHTS

MS 25123-1-6 TERMINAL BOARD
MS 25226-2-6 BUS

HELIO AIRCRAFT CORP.
ELECTRICAL SCHEMATIC
MODEL H-250 AIRCRAFT

C. ELECTRICAL SYSTEM (Cont'd)

FLASHING PROCEDURE - FIELD TO GROUND TYPE GENERATOR

It is sometimes necessary to restore the residual magnetism in the generator field pole pieces. It is done as follows:

1. Raise all brushes from commutator.

2. Disconnect F+ lead from voltage regulator and ground to firewall.

3. Disconnect G lead from voltage regulator. Turn on master switch and flash to B terminal on voltage regulator.

4. Release the raised brushes and attach all previously disconnected wires.

Residual magnetism and proper polarity can be checked in the following manner:

1. With a voltmeter connected to A+ to ground, run up engine to 1500 RPM or above.

2. With master switch in "OFF" position, the voltmeter should indicate between one and two volts.

C. ELECTRICAL SYSTEM (Cont'd)

ADJUST GENERATOR VOLTAGE

It is sometimes necessary to adjust the generator voltage. It is done as follows:

1. Disconnect B+ wire at control box.
2. CONNECT voltmeter across armature circuit. A+ to ground.
3. Control box cover should be in place for all checks.
4. Run up engine to 1500 rpm or above.
5. Adjust regulator spring tension until the voltmeter indicates between 14.2 and 14.4 volts.
6. Reconnect B+ terminal at control box and again run up engine to check for proper operation.

NOTE: Cut-out should connect the generator circuit to the aircraft circuit at between 12.7 and 12.9 volts. When returning throttle toward idle rpm or below generator "coming in speed", the reverse current flow across the cutout points should show a momentary dip at the ammeter toward discharge of 5 amperes maximum before reverse current relay opens.

STARTER

The starter switch in incorporated in the ignition switch. When in the start position, the right mag is grounded automatically.

The starter clutch must be adjusted to 225 to 250 foot lbs. torque.

Fuel quantity is displayed when master switch is on by 2 fuel quantity indicators located in the engine instrument cluster.

RADIO

Radio equipment is optional.

D. HEATING AND VENTILATING SYSTEM

Hot or cold air enters the cabin through stainless steel valves mounted on the forward side of the firewall. Temperature regulation is obtained by use of the control knobs on the instrument panel.

Hot air is obtained by passing cold outside air around one of the exhaust stacks equipped with a muff. The exhaust stack muff must be inspected every 25 hours.

If defroster is installed, hot air may be deflected from the cabin heat vent to the windshield by pulling out both heat and defrost knobs. A/C S/N 2501 and up offer the additional ability of hot or cold or a mixture of hot and cold air to the defroster by pulling the defroster knob and using the hot and cold air knobs to adjust the temperature desired.

E. BRAKE SYSTEM

See page 33 for diagram of brake system installation- Single.
See page 34 for diagram of brake system installation - Dual.
Each rudder pedal on the pilot's side is equipped with a toe brake. The brakes are hydraulic, each pedal actuating a hydraulic piston. The brakes at the wheels are Goodyear disc type.

The parking brake handle locks hydraulic pressure in the master cylinders. Actuating the parking brake control locks the fluid between the brake and the master cylinders. This system utilizes a reservoir located forward of the pilot rudder pedals and secured to the aft side of the firewall.

The brake fluid to be used is MIL-H-5606.

F. ENGINE CONTROL SYSTEM

Controls are provided for the throttle, mixture control, cowl flaps and carburetor heat. All are designed so that they are pushed forward for takeoff conditions, except the cowl flaps, which must be pulled to open.

G. PROPELLER CONTROL

The propeller is controllable with a push-pull flexible cable incorporating a vernier type control which operates a constant speed unit on the forward end of the engine. Minor pitch adjustments can be made by repositioning the mechanical top set screw on the constant speed unit. The propeller should be adjusted as follows:

LOW PITCH

1. Adjust propeller governor speeder spring to fully compressed position.

2. Adjust propeller blade angle to obtain 2600 rpm @ full throttle.
   Pitch in degrees: Low 13.0 High 28.9 @30 inch station.

3. Adjust propeller governor speeder spring to obtain 2575 rpm at full throttle.

HIGH PITCH

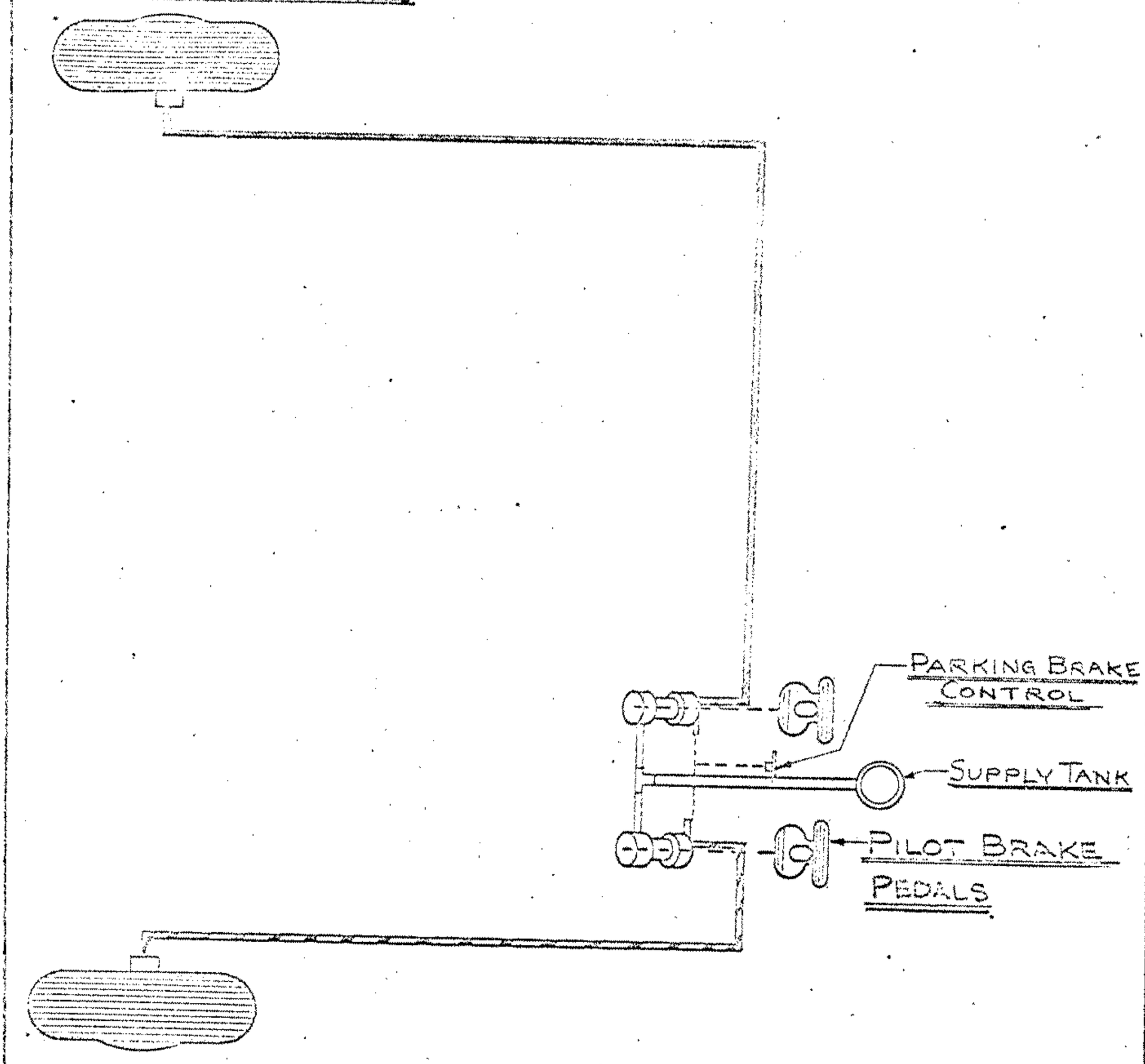
1. Adjust high pitch stop to obtain a drop in RPM from 1500 to 1000 - 50 RPM when the blade angle is changed from low to high pitch.

   Note: The propeller blades must be set within .25° to each other. Complete propeller setup information is provided in the Hartzell Manual for this propeller.

H. LANDING GEAR

1. Main and Tail shock systems - Diagrams provide sufficient servicing information to maintain the main and tail wheel landing gear systems.

2. Tire Pressures:
   Main Tires - 800 x 6 - 28 psi
   Main Tires - 650 x 8 - 28 psi
   Tail Tire - 10:00 - 55 psi



MODEL 250 AIRCRAFT

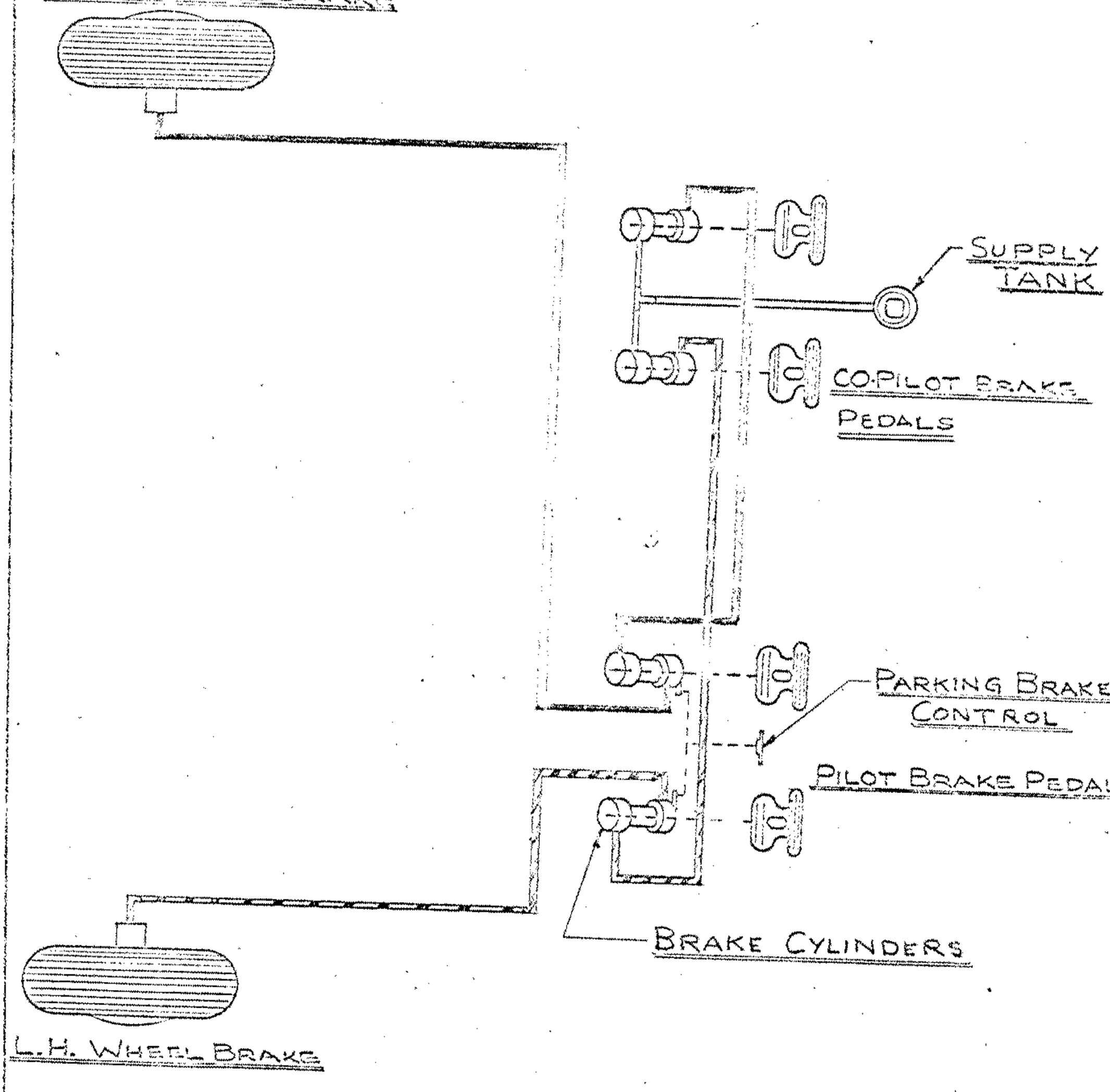
SINGLE BRAKE SCHEMATIC

PRESSURE LINES R.H.

PRESSURE LINES L.H.

SUPPLY LINES

MECHANICAL LINKAGE



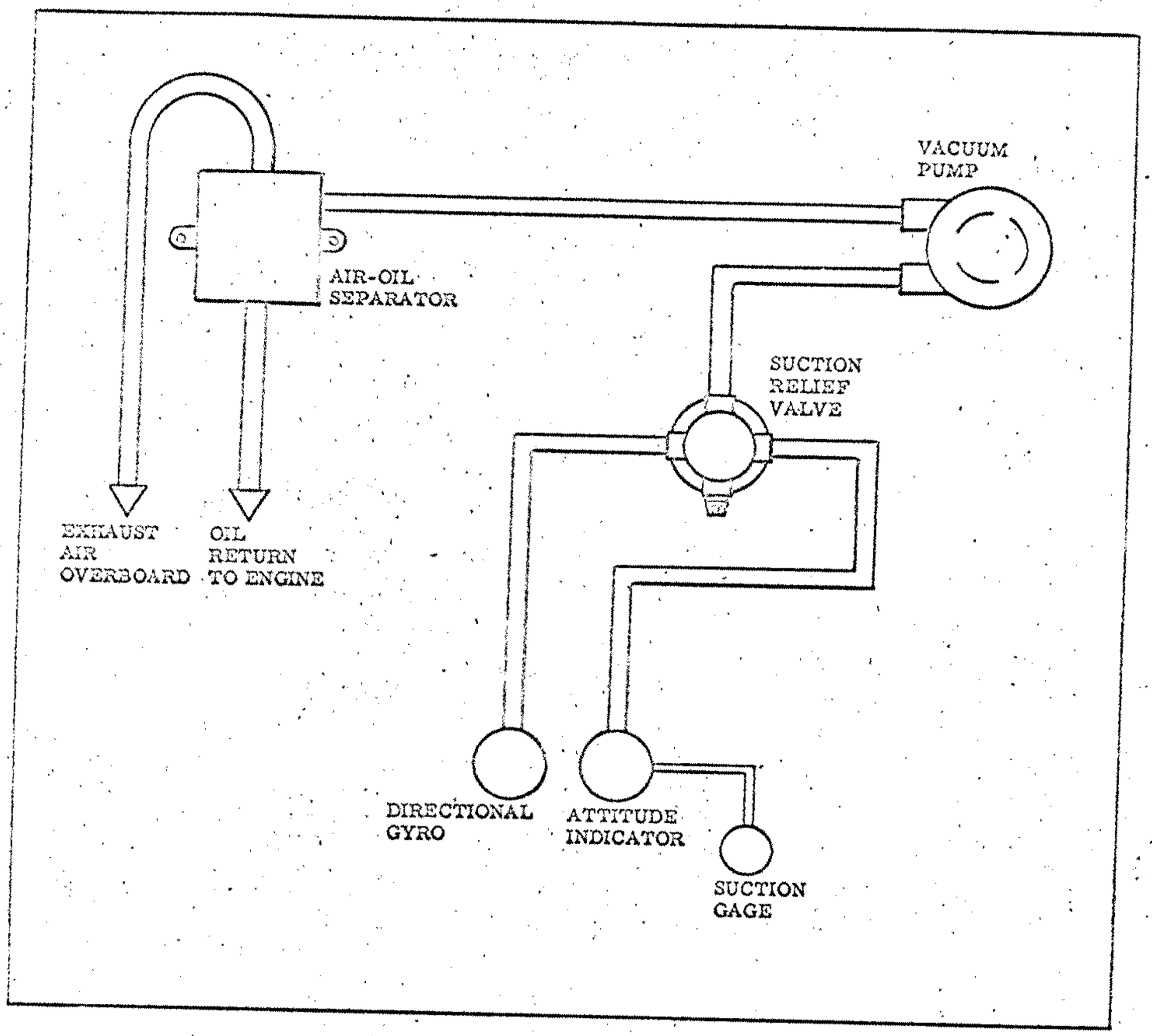
MODEL H-250 AIRCRAFT
DUAL BRAKE SCHEMATIC

PRESSURE LINES R.H.

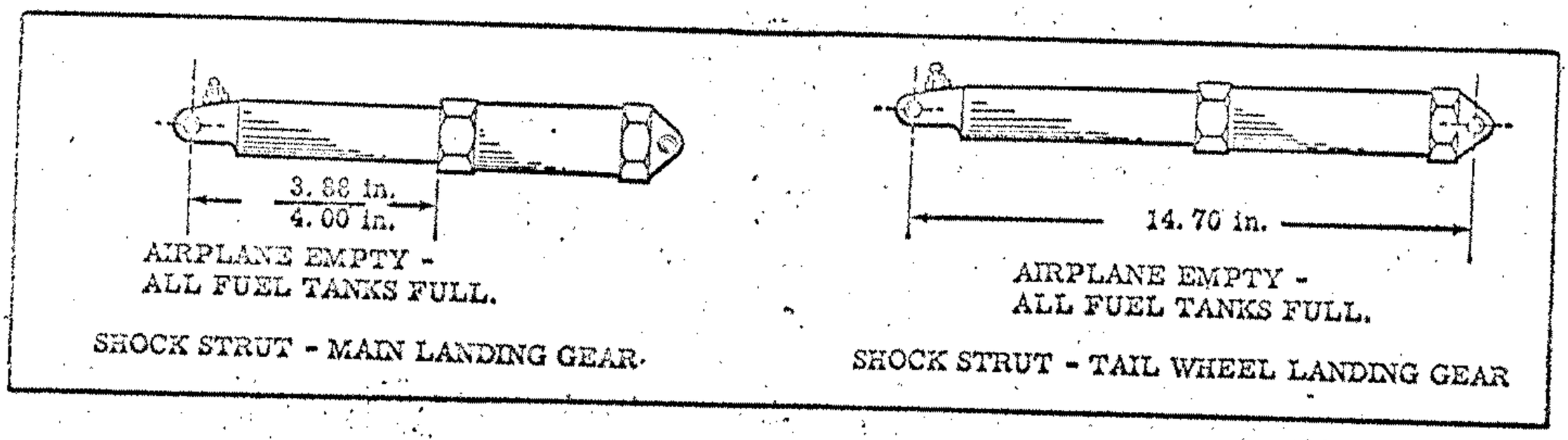
PRESSURE LINES L.H.

SUPPLY LINES

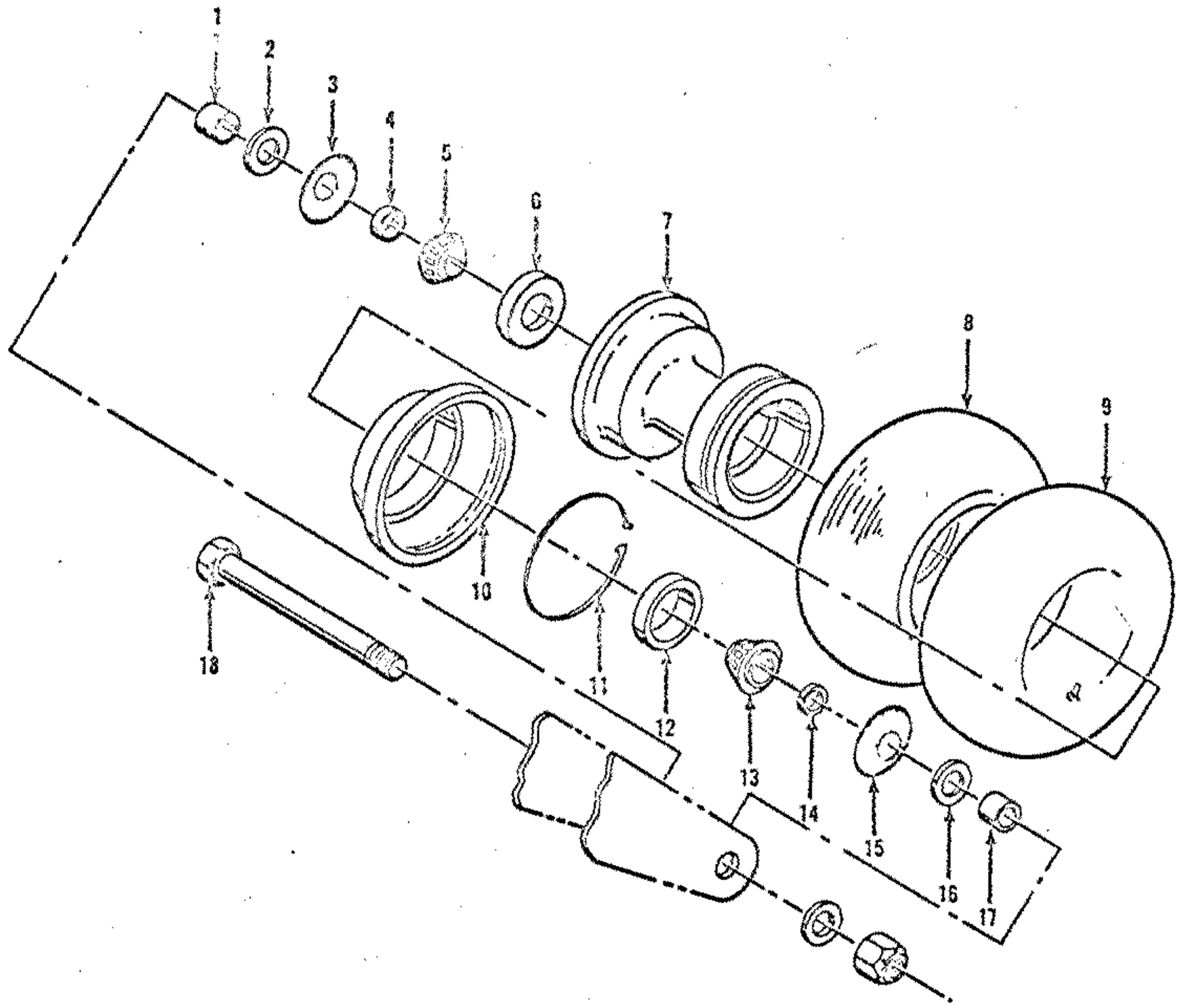
MECHANICAL LINKAGE



Instrument Vacuum System



Landing Gear Shock Strut Extension



1. SPACER
2. WASHER
3. DUST SEAL
4. SPACER
5. BEARING CONE
6. CUP
7. WHEEL SUBASSEMBLY
8. TIRE
9. TUBE
10. FLANGE
11. FLANGE RETAINING RING
12. BEARING CUP
13. BEARING CONE
14. SPACER
15. DUST SEAL
16. WASHER
17. SPACER
18. BOLT

Tail Landing Gear Wheel Assembly

I. PITOT SYSTEM

The pressure head of the airspeed system is located on the wing; the static vents are located on each side of the fuselage about two feet aft of the circular window. The static vents must be kept clean. Erratic operation of the airspeed indicator occasionally occures. It is usually due to water in the static line. It is easily corrected by removal of the static line at the instruments and blowing air through the system.

NOTE: A heated pressure head is available as extra equipment.

SECTION IV - MISCELLANEOUS PROVISIONS

A. AIRPLANE TIE DOWN

One tie down ring is provided on each wing panel. The aft end of the fuselage should be secured by tying down the tailwheel.

When tying down, leave tailwheel in fore and aft position.

Use at least a 5/8 inch manila rope.

If control battens are used on the control surfaces, be sure that they are conspicuous to the pilot on his ground check.

Flaps must be in the full up position.

B. PARKING

The parking brake control is operated in conjunction with the toe brakes. To operate, press the toe brakes to the desired pressure, then pull out the parking brake control located ON THE INSTRUMENT PANEL. Release toe brakes.

To release the parking brake, depress toe brakes and hold until pushing the parking brake control all the way in.

Note: Avoid heavy pulling forces on parking brake handle; the cable merely actuates a small lock, a mechanical mechanism, on the master brake cylinder.

C. TOWING

The airplane may be towed with use of a long rope tied around each axle. A tow-bar may be fabricated which could be attached to both ends of the tailwheel axle.

CAUTION: When using this method the tailwheel must be in the unlock position.

D. LIFTING AND JACKING

The airplane may be jacked on the main wheel axles and lifted on the fuselage just forward of the tail surfaces with the aid of a rod put through the hole covered with snap type covers one inch in diameter and/or if ground handling bars are installed, a sling could be adapted for same.

In addition, when the upper portion of the engine cowling is removed, ropes (or wire) may be passed around the tube cluster of the engine mount at the fire-wall in order to hoist the airplane.

E. AIRPLANE LEVELING

Means for leveling the airplane are provided at the lower sill of the rear door frame. Two AN-4 bolts may be inserted in the two sockets provided, and a straight edge and/or levelset across both bolts in a fore and aft position

F. HEAT TREATED STEEL PARTS

The following steel parts of the Courier II are heat treated. Re-welding of welded heat treated parts is not recommended by the factory.

1. Main Spar Carrythru Assembly over fuselage, 391-030-401.
2. Main Landing Gear Leg Assembly, 391-040-451.
3. Main Landing Gear Pin, 391-040-430.
4. Tail Wheel Fork Assembly, 391-040-421.
5. Tail Wheel "A" Frame Assembly, 391-040-461.
6. Slat Support Tubes, 391-010-431.
7. Flap Tracks, 391-010-414.
8. Lower Main Spar (Front) Attaching Fittings, 391-010-443.
9. Flap Hinge Bearing Housing, 391-011-401-2.
10. Upper Wing Fitting Thrust Washers, HS-15.
11. Upper Wing Fitting Barrel Nut, 391-010-447.

TORQUE CHECK SHEET

Item & Bolt Callout	No. of Places	Torque Value (in pounds)
Carry Thru - Main		
AN-178-31A	4	480 - 520
AN-179-27A	2	800 - 1000
Carry Thru to Fuselage		
NAS-144-28	1	50 - 70
NAS-147-45	2	850 - 920
Fuselage to Tail Cone		
Top - AN 6 H20A	2	220 - 240
Btm - AN 6-25	2	220 - 240
Engine to Motor Mount		
AN-7	4	350 - 450
Motor Mount to Fuselage		
Top - AN7-34	2	500 - 600
Saddle - AN 7-24	1	500 - 600
Saddle to Fuselage		
Ends AN5-13	2	180 - 225
Center AN5-30	1	180 - 225
Fin to Tail Cone		
AN 175-7A	2	100 - 140
Fin to Rear Fitting		
AN 174-5A	1	50 - 70
Stabilator to Fin		
AN 174-11A	2	50 - 70
Tail Wheel "A" Frame to Fuselage		
AN5-25	2	120 - 150
Wing Spar Fittings		
Top Vertical-AN 525-4	18	50 - 70
Btm Vertical-AN 525-4	14	50 - 70
-AN 525-3	4	20 - 25
Slat to Tomahawks		
AN 502 416-14	8	60 - 80
Wing to Fuselage		
Top - NAS 150-DH28	2	2700 - 2900
Btm - 391-010-434-2	2	1300 - 1800
Rear - AN 178-12A	2	480 - 680
Stabilator Hinge		
AN 4-5A	8	50 - 70

TORQUE CHECK SHEET (Cont'd)

Item & Bolt Callout	No. of Places	Torque Value (in pounds)
Fin & Stabilator Attach Hinge AN 4-7A	8	50 - 70
Fin and Rudder Attach Hinges	4	20 - 25
Propeller Flange Bolt to Engine AN-8H-7A	6	60 - 70 ft. lbs.

SECTION V - WEIGHT AND BALANCE

A. WEIGHING INSTRUCTIONS TO DETERMINE EMPTY WEIGHT

1. Drain oil from engine with the airplane in a 3-point attitude.
2. Drain all fuel from both wing tanks. The empty weight should include unusable fuel. Therefore, after draining tanks, add 2.5 gallons.
3. Forward weighing points are the main wheels.
4. Aft weighing point is the lift tube or the tailwheel, whichever is most convenient to use, depending on the weighing equipment available.
5. Level airplane, using leveling lugs.
6. Refer to Section IV for jacking instructions.

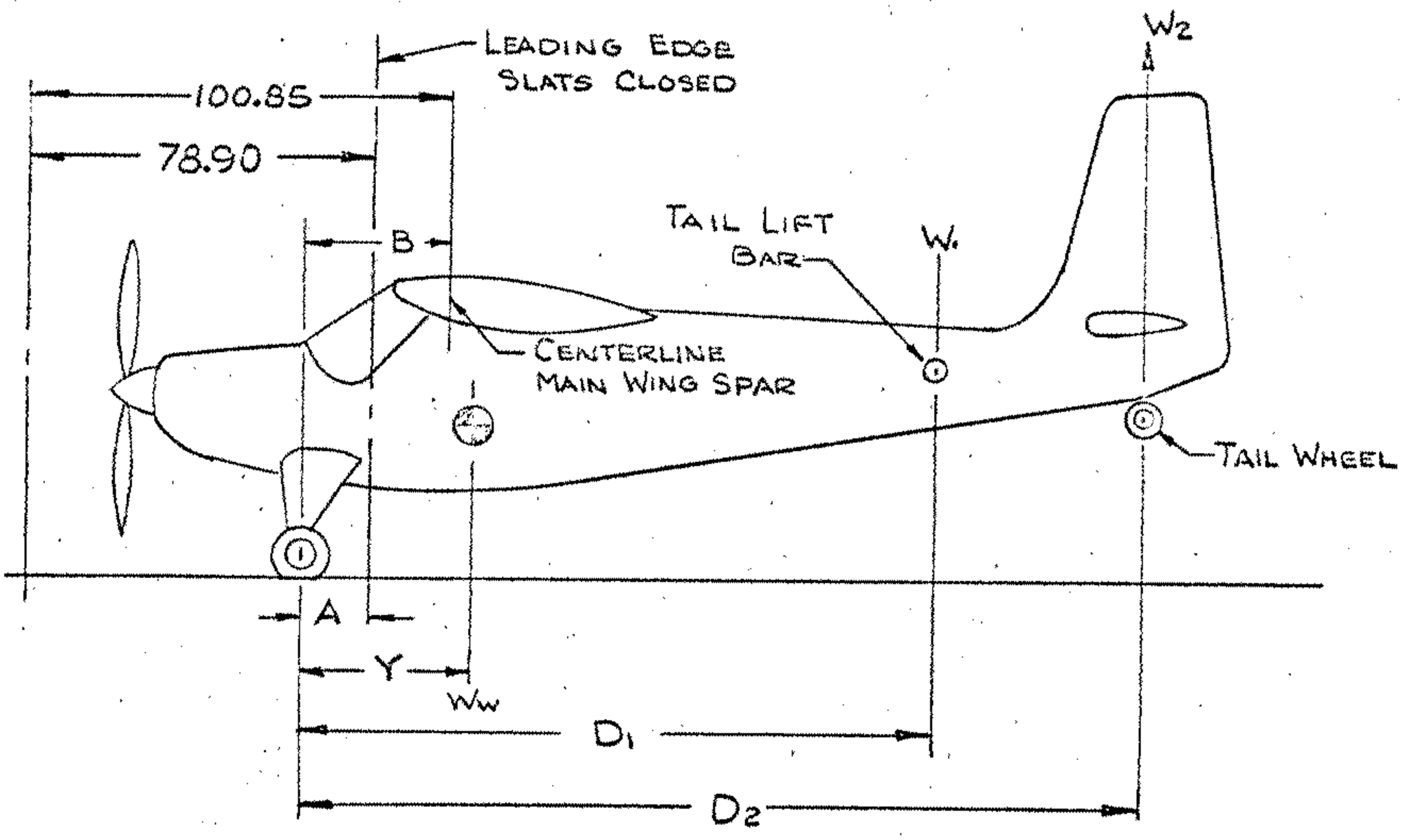
B. DETERMINATION OF EMPTY WEIGHT C.G. LOCATION

Measure distance D_1 or D_2 (depending on aft weighing point used) and also distance "A" along ground line with the aid of a plumbbob. (Ref. Weighing Diagram below).

$$C.G. = \frac{D \times W_t}{W_W} = Y \text{ inches aft of main wheels}$$

A = Distance along ground between wing leading edge (slats closed) and main wheels.
B = Distance along ground between main wheels and centerline main wing spar.
D = Distance between main wheels and aft weighing point. $D = D_1$ for lift tube and $D = D_2$ for tailwheel (Ref. diagram below)
W_t = Weight at lift bue or tail wheel. $W_t = W_1$ for lift tube and $W_t = W_2$ for tail wheel (Ref. Diagram below).
W_W = Total Weight

C.G. = 100.25 - B + Y = Inches aft of datum

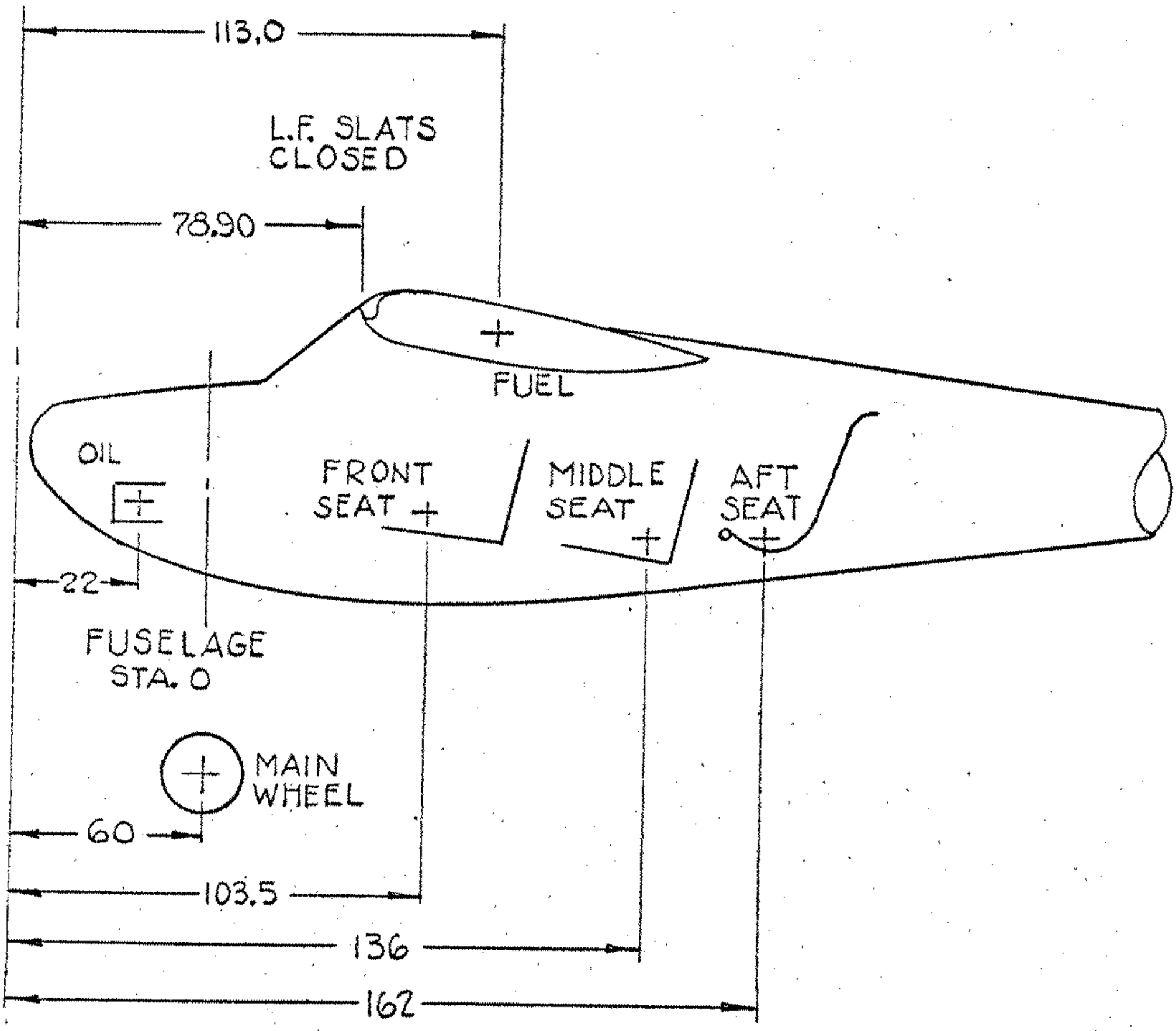


LOADING INSTRUCTIONS

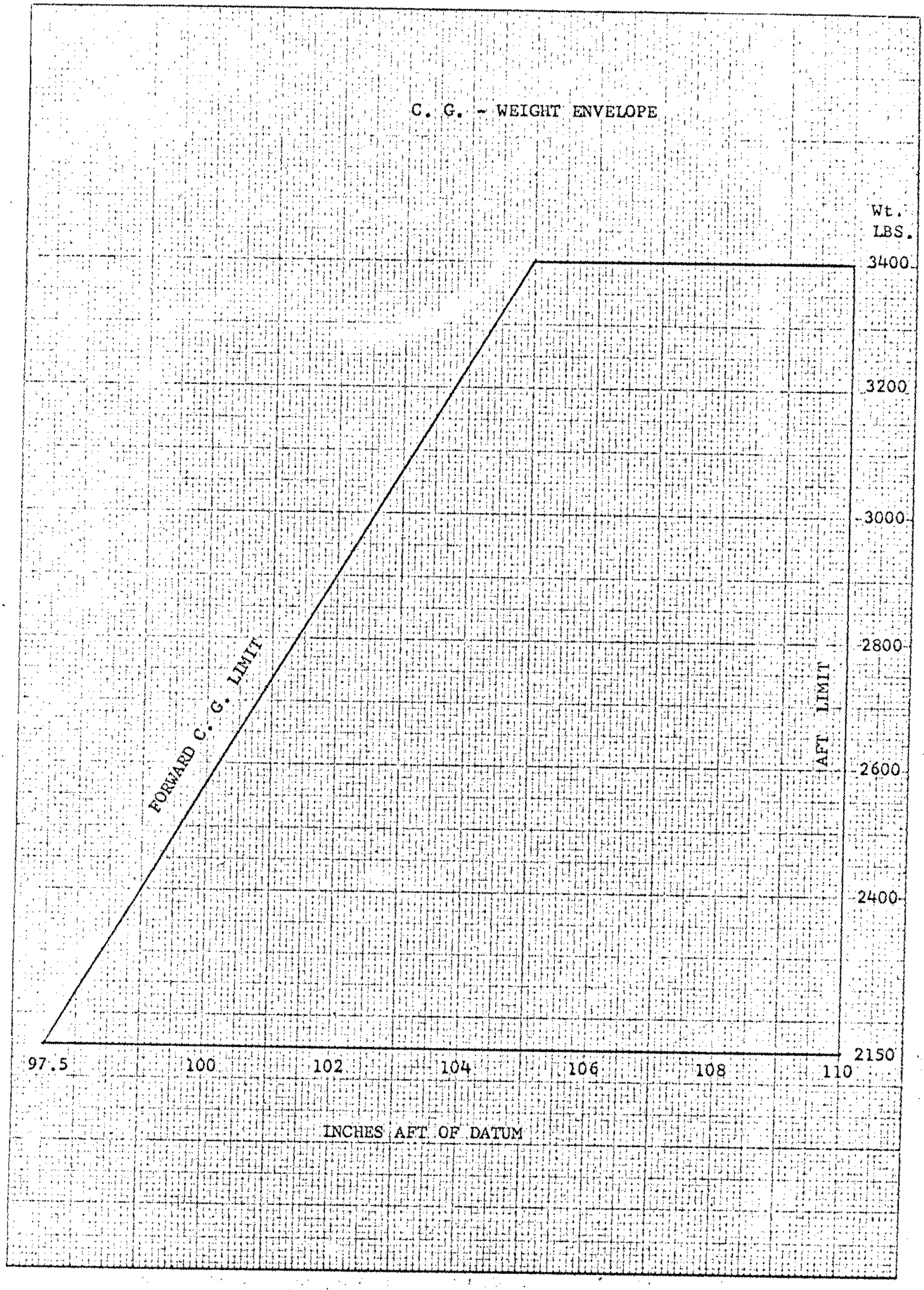
1. The loading diagram with the location of the useful load items is shown below.

2. C.G. range at 2200# is 97.8" to 110.0" Aft of Datum line.

3. C.G. range at 3400# gross weight is 105.0" to 110.0" Aft of Datum line.



C. G. - WEIGHT ENVELOPE



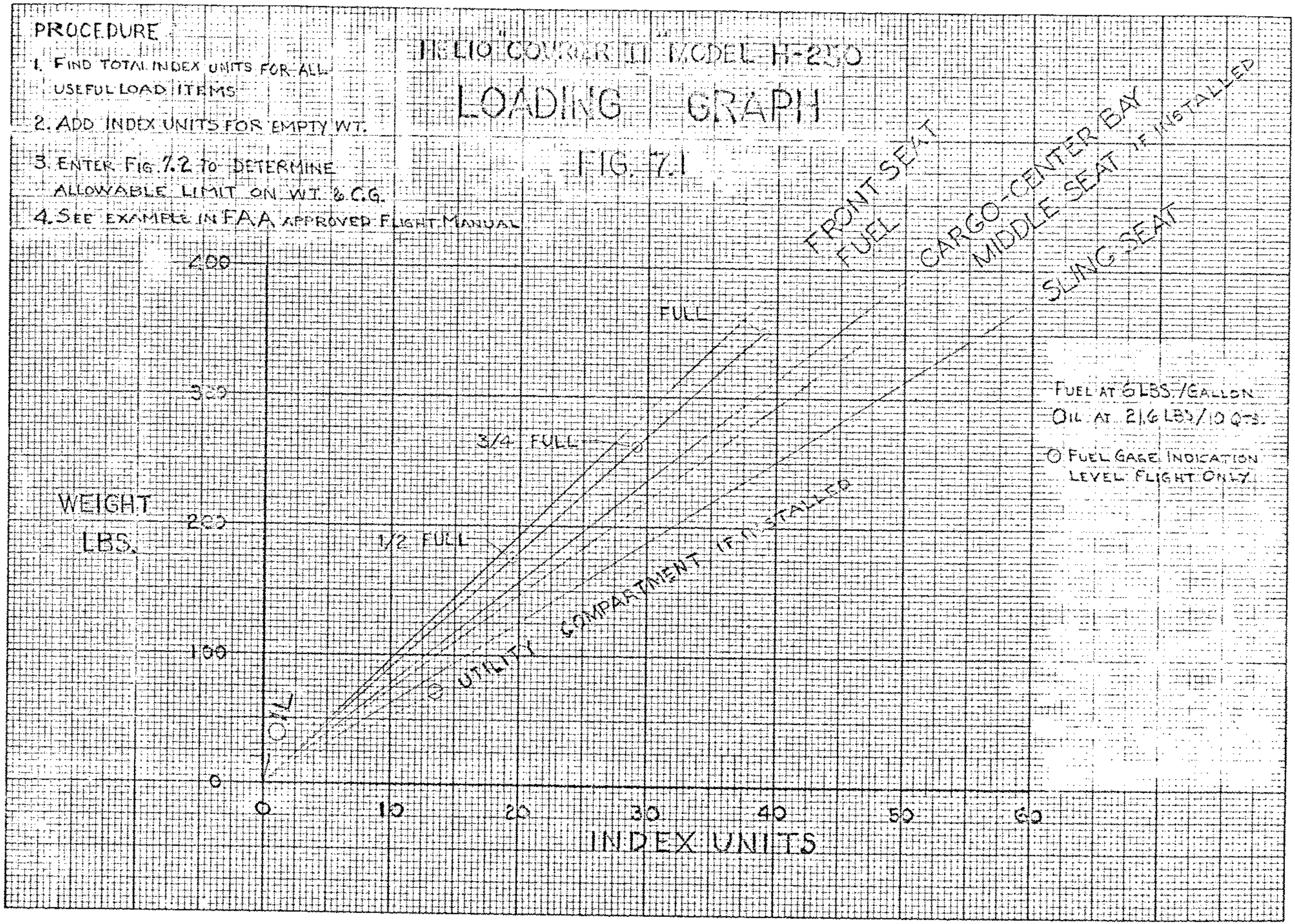
PROCEDURE

1. FIND TOTAL INDEX UNITS FOR ALL USEFUL LOAD ITEMS
2. ADD INDEX UNITS FOR EMPTY WT.
3. ENTER FIG 7.2 TO DETERMINE ALLOWABLE LIMIT ON WT. & C.G.
4. SEE EXAMPLE IN FAA APPROVED FLIGHT MANUAL

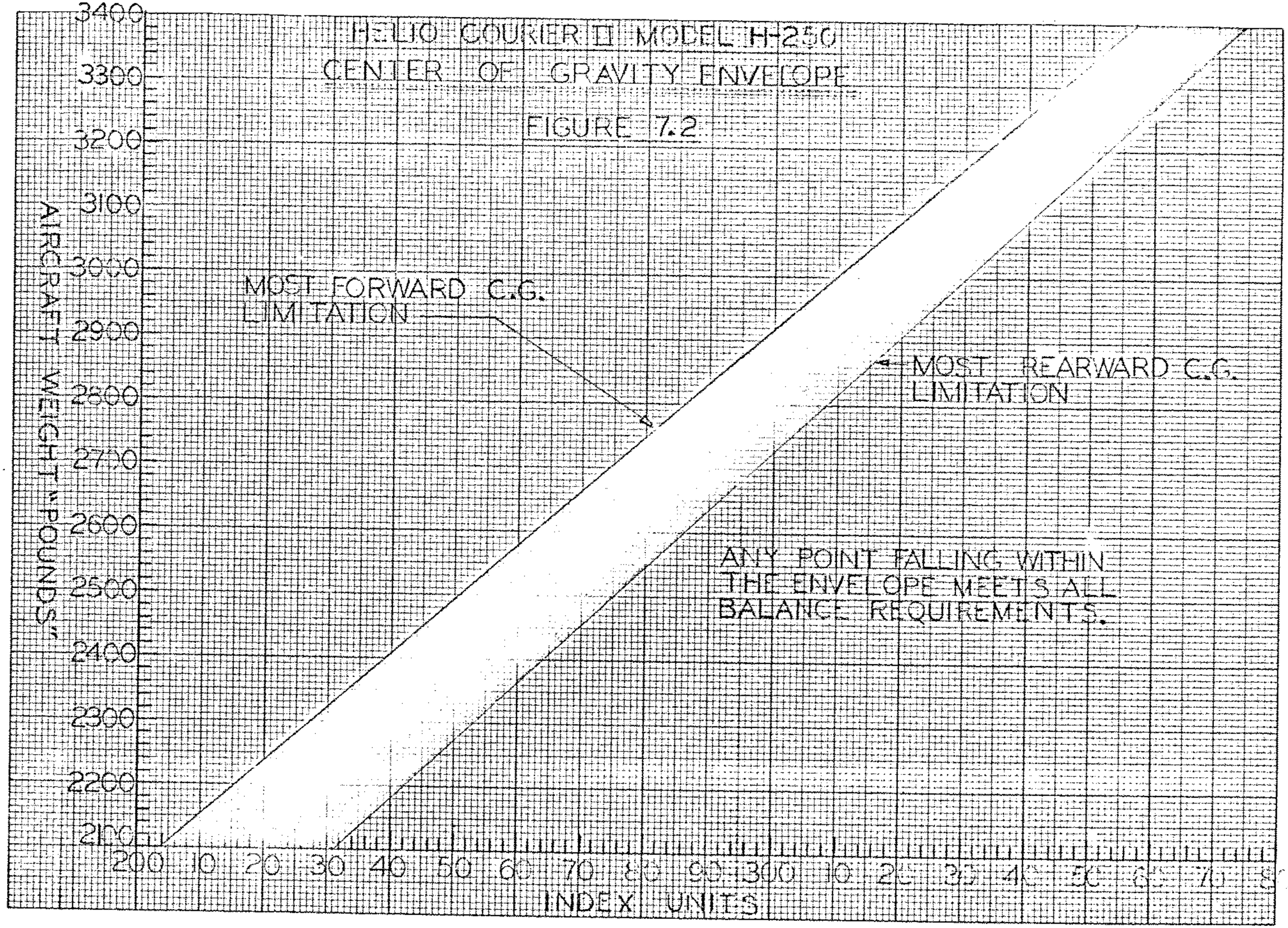
HELIO COURIER MODEL H-250

LOADING GRAPH

FIG. 7.1



HELIO COURIER II MODEL H-250
CENTER OF GRAVITY ENVELOPE
FIGURE 7.2



SECTION VI - INSPECTION GUIDE - 100 HOUR INSPECTION

SECTION 1 - WINGS

1. Remove all cover plates on bottom of wings.

2. Remove wing butt gap covers; check fuel line between butt & top deck rib.

3. Check spar fittings and carrythru and fittings for elongation, distortion, cracks or corrosion.

4. Check top, bottom and rear attachment bolts for tightness.

5. Check for any play between fittings by having a helper move wing tips up and down and feeling between fittings.

6. Inspect all internal wing structure for cracking, distortion or corrosion.

7. Check actuation of slat gear, torque tube and play, roll pin tightness through torque tube and slat levers, safetying of slat support tube rollers, slat lever bumpers and link bolts.

8. Check tightness of attaching screws retaining slats to support tubes. ("tomahawks").

9. If "tomahawks" show any rust, wipe off with a cleaning fluid -- do not oil surface.

10. Slats should operate with the slightest of help.

11. Check clearance between slat lever arms and aileron cables; slats in full "out" position.

12. Check actuation and condition of flap gear.

13. Check flap operating lever clearances with slat torque tubes.

14. Check lock nuts on all push pull tube ends.

15. Check "flap track" attachments to ribs.

16. Check safety and condition of flap bearing retainer bolts.

17. With flaps in full up position, exerting an up and down pressure on trailing edge, there should be <u>NO</u> play.

18. Check that travel between Right and Left flaps is coordinated and hitting ends of track travel together.

19. In cabin, remove overhead cover (over pilot's head) and check flap jack screws for bends or binding.

20. Check condition of universals and safetying of universals to jack screws and mechanism drive ("brain") shaft.

21. Check both "brain" shafts for end play; there should be no play.

22. Check 'brain' assembly for side play; check 'brain' bracket and braces for condition and tightness of attachment to carrythru.

23. Check the carrythru structure for distrotion, cracks and corrosion.

24. Check the attachment of carrythru to fuselage (3 places) by having a helper move the wing tips up and down, and feel between bushing attach points. Check tightness of bolts.

25. Check condition and operation of trim tab controls, pulleys and cable runs. Check condition and operation of trim tab indicator and wire.

26. Check safetying of aileron balance cable turnbuckle. Check aileron crossover pulleys and fairlead.

27. Check aileron cables condition and routing through wing butt and entire span of wing to bellcranks. Check cable tension. Check safety of turnbuckles.

28. Check installation of aileron push pull tube and tightness of end lock nut.

29. Check condition at aileron of push pull attach bolt and condition of doubler plates and hole in aileron center ribs.

30. Check that aileron hinge bolts do not rotate.

31. Check that there are two washers each side between aileron and wing attach points and that there is clearance.

32. Check condition of aileron fabric covering and check attachment of balance weights in leading edge.

33. Check condition and attachment of arms to interceptor blades and torque tubes.

34. Check torque tube for end play.

35. Check blade clearance with wing slots.

36. Check condition and bolting of actuating arm & push pull tube.

37. Check condition of pitot tube and attachment.

38. Check navigation lights and wiring.

39. Check condition and attachment of tips.

40. Check overall external surfaces of wing for signs of cracking, wrinkling or deep canning.

41. Check fuel tankstrainers, through hand holes on the lower surfaces of the wing aft of the rear spars right next to the root ribs.

42. Check condition and attachment of aileron bellcrank.

43. Check all castings and fittings for cracks and corrosion.

SECTION 2 - FUSELAGE CABIN

1. Check step for security.

2. Check pilot's window latch and door latch.

3. Check rear door latch and/or if installed litter door lock bolts/pins.

4. Check both door top leading edge latches for proper operation.

5. Check particularly around the window area of the plastic door frame shell for any signs of cracking or separation of the laminate or the laminate to the sheet metal skin.

6. Check condition of safety harness and retainer bolts.

7. Check seat security and condition of covering.

8. Check over entire inside trim for security and cleanliness.

9. Open headliner (zipper); check fuel lines for leaks or abrasions, and for security.

10. Check fuel tank cross vent line for low spot (a low spot could house fuel and prevent a tank from feeding).

11. Check trim tab cables and fair leads; check that overhead insulation is secure and away from cable runs.

12. Check security of antenna and naviagation light wires.

13. Remove kickpans each side of pedals; turn back carpet and remove front floorboards.

14. Check lower control yoke attach bolts. Check yoke for full travel. Check location and condition of forward control yoke secondary stop (fwd. of instrument panel). Check for clearance with flexible cable controls running forward from instrument panel.

15. Check safety of bolts attaching sprockets and universals to yoke bearings.

16. Check tightness and travel of chain between sprockets.

17. Check safety of chain ends to links. Check four hold link for bend.

18. Check attachment of control wheels to shafts and shafts to universals.

19. Check trunion bracket attachments, adjustment screws and nuts. There should be no binding or stiffness in this system.

20. Check condition of rudder pedals and tightness of bolts retaining them in control tubes.

21. Check rudder pedal assembly and support bearings. Check carefully for cracks in bearings.

22. There are 15 pulleys behind or below instrument panel; check their attachments.

SECTION 2 - FUSELAGE CABIN (Cont'd)

23. Make a thorough inspection of all control cables, especially of aileron cables at double pulley points located at bottom outboard ends of the instrument panel. Also where rudder cables make bend around first pulley under the floor boards beneath pilot's seat.

    All cables should be thoroughly greased with heavy duty grease where they ride over the pulleys in order to reduce the possibility of fraying. If frayed, check CAM 18 for requirements for replacements.

24. Check that brakes are "high". Check condition and attachment of master cylinders.

25. Check hydraulic lines and fittings.

26. Grease rudder pedal assembly.

27. Check fuel and static air line right side.

28. Check all tubular structure in this area, particularly lower longerons near forward and aft landing gear attachments.

29. Check back of control panel for security of locknuts on controls and check tube connections on primer.

30. Check all instruments are secure and that tube connections are good.

31. Check all electrical terminals for security, wiring security, chafing or indications of shorting.

32. Check instrument faces for rotation mis-alignment. (Alignment of white dot on glass and case).

33. Check security of radio gear.

34. Reinstall floor boards, carpet and side panels.

35. Check condition of pedal boots (No holes).

36. Outside A/C right side for fuel leak indicated at drain hole at rear corner of gascolator box.

37. Check, and if necessary, clean gascolator.

38. Check security and condition of all windows and windshield.

39. Check attachment of antennas to top overhead dock.

SECTION 3 - TAILCONE

1. Remove bulkhead back of baggage compartment.

2. Check four tie-in bolts, cone to steel tube structure, for torque and re-safety bolts.

3. Check overall conditions of skin, formers and stringers, particularly the aft 3 formers of tailcone.

4. Check condition of all pulleys, fairleads and attachment brackets and safetying of bolts.

5. Check rudder, stabilator and trim tab cables and their runs. Check cables at stabilator sector groove to see that they do not rub side to side in operation. Check that bushing spacers are used at cable attachments to sector.

6. Check all cable tensions (35 to 40 lbs) and safety turnbuckles.

7. Check condition and run of trim tab indicator wire.

8. Check trim tab cable run, operation of drive barrel, and attachment of flexible pushpull trim tab control. Check attachment of barrel brackets. Check attachment of trim tab indicator wire.

9. Check tail gear "A" frame attachment fittings.

10. Check radio power pack installation.

11. Check static lines and vent fitting; check vent holes outside tailcone surface for cleanliness.

12. Check belly of cone for dents or deep scratches.

13. Check entire cone skin for cans, wrinkles or cracks.

SECTION 4 - EMPERNNAGE

1. Remove plastic forward and metal side fin fairings.

2. Check 2 bolts attaching front spar of fin to tailcone; check attachment and condition of fittings.

3. Check rear fin spar attach bolt and fittings.

4. Check 8 bolts attaching stabilator hinge fittings to fin front spar. Check condition of fittings for cracks.

5. Check two "close tolerance" AN pivot bolts attaching stabilator to fin. There should be no play between bolts and fittings and bearings. The bolts should be tight enough to bind outer hinge fittings to inner race of bearings.

6. Check condition of stabilator box spar splice and attachment of sector horn; check bolt tightness. Check leading edge rivets attaching balance weights for looseness.

7. Check 3 hinge bolts attaching rudder to fin and rudder to tailcone. Check for proper spacer washers and adequate clearance between rudder to fin and tailcone brackets.

8. Check attachment and condition of phenolic rudder and stabilator stops.

9. Check rudder leading edge clearance to fin skins and fairings.

10. Check trim tab and anti-balance tab to stabilator hinge points. Check for clearance between tab leading edge skins and stabilator skins.

11. Check attachment of actuating arm to tabs. Check anti-balance arm for slot wear and clearance to fin fairing. Check for bolt hole elongation in trim tab actuating arm.

12. Check trim tab push-pull control for slippage at clamp on stabilator butt rib.

13. Check lock nut on control fork end of trim tab push-pull control.

14. Check "free play" of both tabs. The free play should not exceed 1/8 inches overall as measured at the trailing edge of the tab. Only sufficient pressure should be used to take out slack.

15. Check routing of naviagation wire and tail light condition.

16. Check rudder cables to rudder horn attach bolts for wear and safetying. Check for elongation of horn bolt holes.

SECTION 5 - TAIL GEAR

1. Remove inspection cover left side. Remove tail gear boot. Repair or replace if worn through.

2. Check two pivot bolts attaching "A" frame to tail cone fittings. Remove "A" frame pivot bushings; clean and grease. Bolts should be tight, binding inner bushings to tailcone bushings.

3. Check safety of shock strut attach bolts. Check for bolt wear, elongation in upper and lower attach brackets and upper bushings.

4. Check attachment and general area of upper tail shock strut attach brackets.

5. Check shock strut inflation (See placard on inspection cover). If there are signs of excess leakage, check fluid level.

6. Repack tail wheel bearings.

7. Check tightness and safety of axle bolt - no side play in wheel.

8. Check tire condition and inflation - 55 lbs.

SECTION 6 - MAIN LANDING GEAR AND WHEELS

1. Remove gear fairing and root fillets. Remove lower engine cowl.

2. Visually inspect entire landing gear assembly for cracks (clean up any corrosion).

3. Check forward main leg attachment pins; there should be no space between main pivot bushing and engine mount and fuselage attach bushings. Check safety of pivot pin retainer bolts.

4. Check condition and safety of rear pivot bolt -- grease through Zerk fittings.

5. Check condition and safety of upper and lower shock strut attach bolts.

6. Check shock strut inflation (see placard on firewall). If there are signs of excess leakage; check fluid level.

7. Check wheel axle installations for looseness. Check tightness of retainer bolts.

8. Check hydraulic brake lines for wear at fairing and through fuselage grommets. Check universal fittings and line connections at wheel cylinders.

9. Check tires for wear and cuts; check inflation -- 28 lbs.

10. Check condition of brakes and discs.

11. Check condition of wheels; remove cover and torque wheel half bolts to 120 in/lbs.

    (See Goodyear Operation and Service Manuals; Cross-wind Landing Wheels and Single Disc Brakes; and Wheels for Light Airplanes for more detailed information).

SECTION 7 - ENGINE COMPARTMENT

1. Check tightness and safety of engine mount top bolts. Check lower pins (see Sect. 6, item 3). Check two center attach bolts to mounting spacer block. Check 3 bolts attaching center mounting block to fuselage center tube.

2. Check condition of mount tubes for bends, cracks or corrosion. Check for corrosion below battery box. Remove diagonal tube lagging; check for or clean away corrosion, if any, and re-lag.

3. Check condition of cowl flap torque tube plain bearings and actuating arms.

4. Check condition of "sandwich mount" rubber for excess cracking or sagging.

5. Retorque (400 to 450 in/lbs) and safety 4 engine-to-mount attach bolts.

6. Check condition of oil cooler clamps and brace; check hose connections, clamps and condition of lines.

7. Check exhaust stacks and brace for cracks and 3 lower exhaust clamp bolts. Check flange gaskets and nuts. Remove heater muff wrap - check for cracks and loose baffles (every 25 hours). Check condition and securing of heater flex lines. Check support tubes, ball joint and slip joint clamps and bolts.

8. Check tightness and safety of screws attaching carburetor air box to carburetor. Check condition of box and box drain, carburetor heat valve.

9. Check security and condition of engine baffling, magnetos, generator and battery box blast tubes and rubber seal along top of baffles. Check for frayed or cracked "V" belt on generator. Belt should have no more play than 3/8 inch.

10. Remove battery. Check condition of battery and water level. Check box and drain for excess corrosion and condition of insulators and grommets. Check platform, brace and hold-down bolts. On installation, don't forget to reinstall drain. Check condition of positive and ground cables and the attachment of them.

11. Check the attachment of the vacuum pump separator, drain lines and clamps.

12. Check that the starter and master solenoid and generator control box are mounted securely.

13. Check the mounting of the auxiliary fuel pumps and check through <u>all</u> fuel lines and fittings to and from carburetor and fuel pumps.

14. Check the operation of cabin cold and hot air valves and controls.

15. Check all lines, controls, fittings and grommets at the firewall.

16. Check attachments of all electrical wiring and the condition of insulation

17. Check ease of operation, stops and attachments of all engine controls, throttle, mixture, carburetor heat, cowl flap, prop governor control and parking brake control.

18. Remove, clean and oil carburetor Air Maze Filter (located in forward section of lower nose cowl). Blow dust out from aft side with compressed air, wash with solvent and re-install. When operating in extremely dusty conditions, clean at least every 20 hours. If a spare filter is available, dip in light oil (SAE #10 or equivalent) and hang up to drip for at least 48 hours before re-installing.

19. Check fly wheel for worn or broken cogs. Check starter dog for wear and broken cogs.

20. Remove battery. Check condition of battery and water level. Check box and drain for excess corrosion and condition of insulators and grommets. Check platform, brace and hold-down bolts. On installation, do not forget to reinstall drain. Check condition of positive and ground cables and the attachment of them.

SECTION 8 - COWLING

1. Check condition of cowling and landing gear fairings. Inspect cowl stiffeners and hinges for cracks and looseness of rivets at ends. Repair dents, cracks and elongated holes.

2. Check condition of protection chafe strips around cowl opening.

3. Check condition and attachment of cowl flaps, spreader and actuating rods.

4. Check rivet tightness attaching cowl flap hinges for excessive wear between hinge and hinge pin.

5. After completing 100 hour engine inspection according to Lycoming Operator's Manual, reinstall cowl and gear fairings, making double check on all retainer screws with washers.

6. Check back over the engine compartment, Section 7, and hook up the cowl flap control rods. Recheck the cabin heat and cold air flex tubes to be sure that they were not disturbed in re-installing cowling. Check that engine breather, battery, carburetor air box, vacuum system, auxiliary and engine fuel pump drains are through their grommets and fastened securely at all attachment points.

7. Check Dzus fastener springs and ease of fastening upper cowl.

SECTION 9 - PROPELLER

1. A. Check condition of spinner and spinner attachement bulkhead.
   B. Check for loose rivets between web of spinner bulkhead and bulkhead boss by pushing up and down on spinner.
   C. Remove spinner from adaptor and check for cracks around rivets.
   D. Check for loose bolts that secure spinner bulkhead to engine flywheel.

2. A. Check tightness of low pitch stop nuts.
   B. Check tightness of high pitch screws.
   C. Check blade pitch section against high and low stops.

3. Check hub bolt tightness to blade.

4. Check security of balance weights.

5. Grease Zerk fittings equal amounts of lubriplate 630AA.

6. Reinstall spinner, check screw tightness and check clearance of spinner to nose bowl opening.

7. Dress out blade nicks.

8. Check out prop during engine run-up (See section 3, item G).

LONG RANGE MAINTENANCE RECOMMENDATIONS

1. Attachment bolt assemblies and attachment fitting assemblies.

   A. Remove and visually inspect every 500 hours:

      1. Attach bolts of tail cone to cabin section
      2. Engine attach bolts.
      3. Motor mount attach bolts
      4. Bottom and rear spar wing attach bolts
      5. Top main spar wing attach bolt (magnaflux)
      6. Fin, rudder and stabilator attach bolts
      7. Main gear pivot pin -430 (magnaflux)
      8. Main wheel and tailwheel assemblies
      9. Tail gear and tail shock attach bolts
      10. Aileron and flap attach bolts
      11. Carrythru to fuselage attach bolts

   B. Replace brushes when 25% wear is evidenced on:

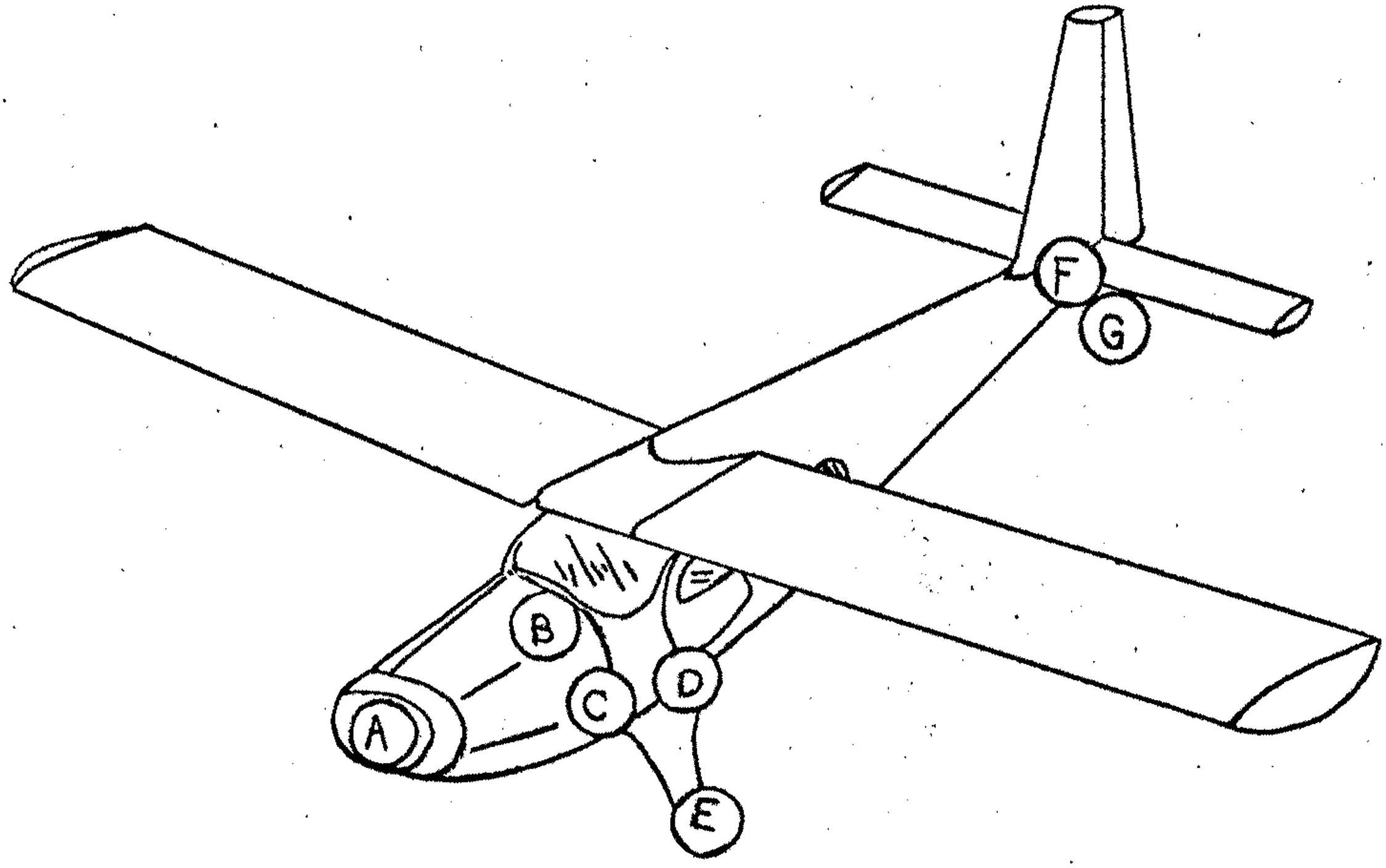
      1. Starter
      2. Generator

   C. Remove and replace shock strut attach bolts to gear and fuselage every 500 hours

   D. Inspect voltage regulator for burned points every 500 hours, otherwise best undisturbed.

2. No detailed inspection of main fuel tanks unless evidence of leaks.

3. For Engine Top Overhaul and Engine Major Overhaul, See Lycoming Service Letter No. L127.



ZONE	PART	ACCESS	NO. ZERKS	LUBRICANT
A	Propeller Hub	Remove Spinner Dome	2	Lubriplate 6300AA Friske Bros;Toledo
B	Rudder Torque Tube Assy.	Remove 391-030-731 Copilot's rudder pedal boot assy & raise floor carpts. If applicable.	2	General Purpose Chassis Lube AN-G-5
C	Main Ldg. Gear Pivot Pin	Raise Cowl doors & remove 395-030-322 ldg. gear boot doubler	2	"
D	Main Ldg. Gear Drag Strut Ftb.	Remove 391-030-528-51 & -52 ldg. gear boot assy	2	"
E	Goodyear Std. & Crosswind Wheel	Disassemble wheel	--	Long Fiber Wheel Bearing Grease
F	Stabilator Hinge Attach Assy	Remove 391-031-503 Tailcone Fillet	2	General Purpose Chassis Lube AN-G-5
G	Steerable Tail-Wheel (Head Assy)	Remove 391-010-333 Tailwheel Inspection Cover Plate If applicable	2	"

Lubrication Chart