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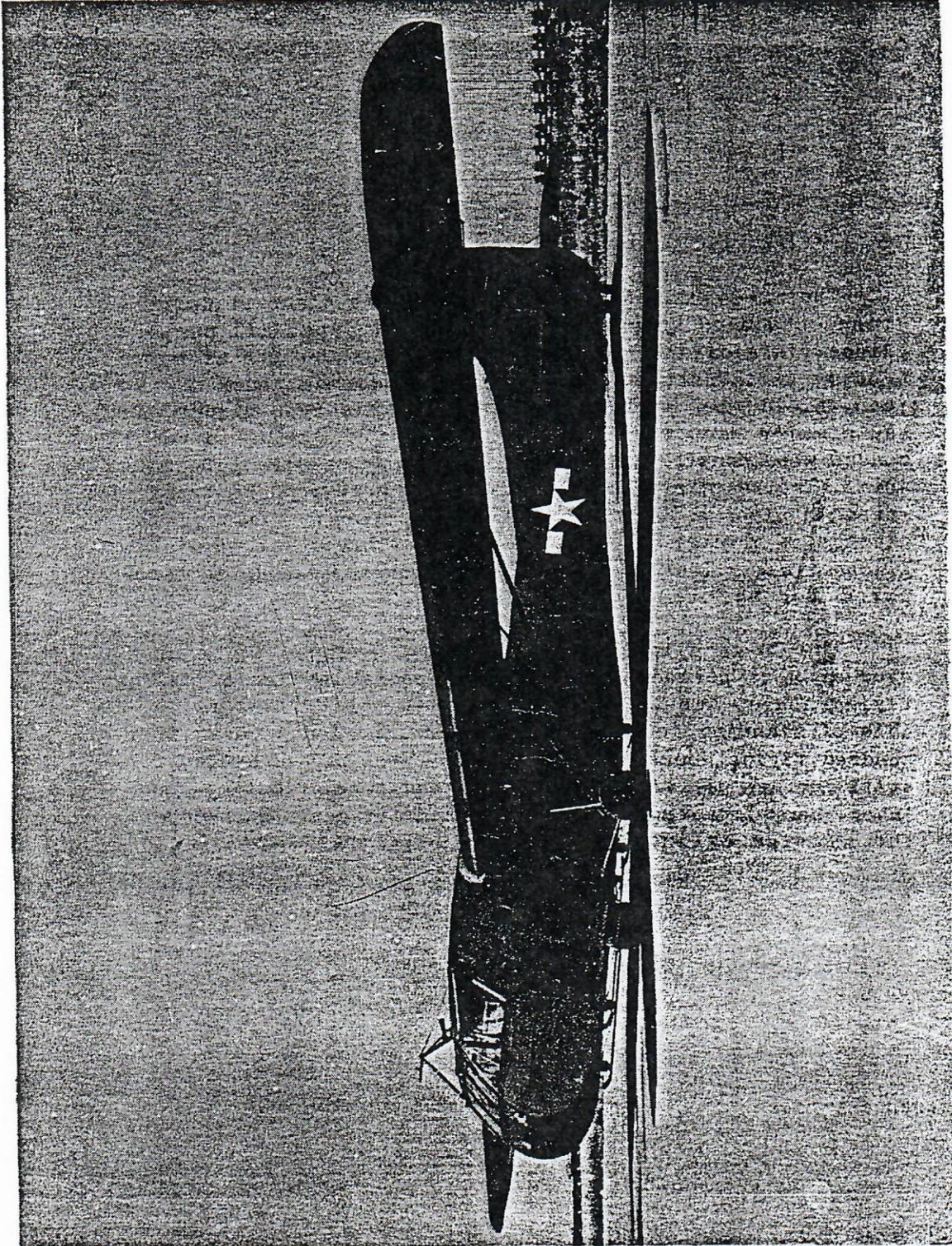
### PREFACE

The CG-4A Glider as designed by Waco Aircraft Corporation, has been selected as a standard type, all purpose glider. In addition to serving as a transport for airborne troops, it is used to carry wheeled equipment such as the jeep, field gun, howitzer or tractor. This type glider has had a major part in pioneering the use of synthetic resin bonded wood construction, using a minimum of strategic material. The resultant light weight and corresponding tensile strength gives a low wing loading that permits it to carry a cargo of greater poundage than the original weight of the glider. This glider may be disassembled very easily and prepared for shipment in five crates.

The CG-4A glider was originally designed to be used over a short period of time with a possible life of fifty flying hours. Service has proven that this glider is capable of standing rough handling over a period of over four hundred flying hours. The glider can then be overhauled for still further use with a minimum expenditure of material and labor. Many improvements have been made to meet the needs of the service as indicated by actual experience.

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CG-4A Glider

3 / 4 FRONT VIEW

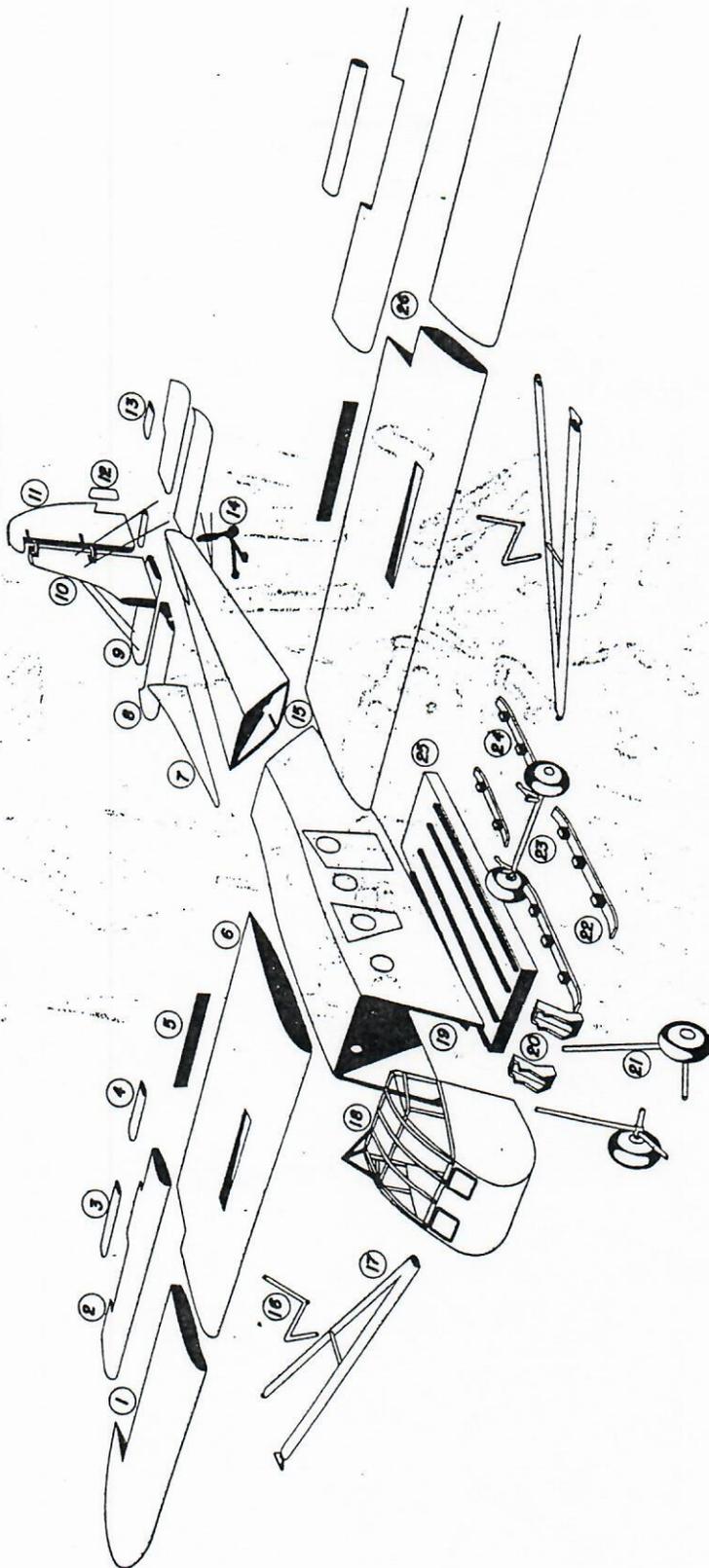
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DESCRIPTION  
of the  
CG-4A GLIDER

COMPONENT PARTS-CG-4A GLIDER



- 1. OUTBOARD WING
- 2. ALLECON, R.H.
- 3. TAB, FLETTNER (R.H. ALLECON)
- 4. TAB, TRIM (R.H. ALLECON)
- 5. SPOILER
- 6. INBOARD WING
- 7. DORSAL FIN
- 8. STABILIZER
- 9. ELEVATOR
- 10. FIN (VERTICAL STABILIZER)
- 11. RUDDER
- 12. TAB, TRIM (RUDDER)
- 13. TAB, TRIM (ELEVATOR)
- 14. TAIL WHEEL
- 15. FRAME (REAR SECTION)
- 16. FITTINGS (REAR SECTION)
- 17. FAIRING (REAR SECTION)
- 18. STRUT, MAIN
- 19. FRAME (FRONT SECTION)
- 20. FITTINGS (FRONT SECTION)
- 21. TAKE OFF GEAR
- 22. SHIDS, MAIN LANDING
- 23. SHIDS, REAR LANDING
- 24. FLOOR
- 25. FAIRING (CENTER SECTION)
- 26. RAMP
- 27. FAIRING (CENTER SECTION)
- 28. RAMP
- 29. LANDING GEAR
- 30. SHIDS, MAIN LANDING
- 31. TAKE OFF GEAR
- 32. SHIDS, REAR LANDING
- 33. FLOOR
- 34. ALLECON, L.H.

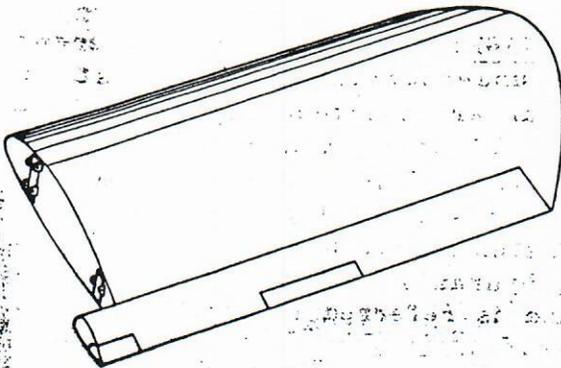


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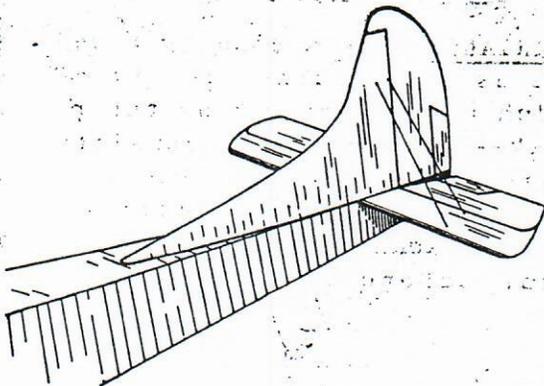
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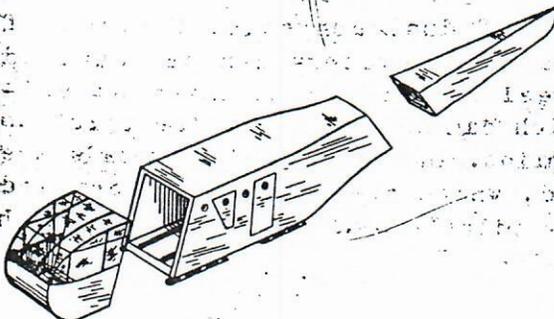
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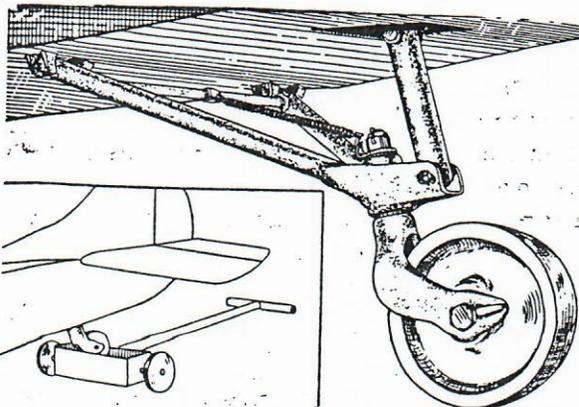
**WING:** The CG-4A Glider has a high wing of 2-spar wooden construction, ply wood stressed skin to the rear spar and fabric covered. The wing is externally braced and made in four sections to facilitate crating and shipping. The wing span is 83 feet 8 inches with a chord of 10 feet 6 inches making a total area of 851.5 sq. ft.



**EMPENNAGE:** The empennage of a CG-4A Glider consists of the horizontal and vertical stabilizers, rudder, elevator and tail wheel. The stabilizers, rudder and elevators are constructed of both structural wood and plywood. All sections are covered with aircraft fabric and then doped. The elevators and rudder are also equipped with trim tabs.

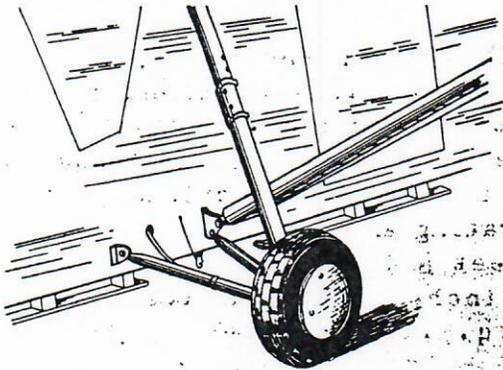


**FUSELAGE:** The fuselage is the main body of the glider and is composed of the nose section, center section and tail section. The nose and tail section are fastened to the center section with steel bolts. The fuselage frame is constructed of welded steel tubing with wooden fairings attached to the frame to support the fabric covering.

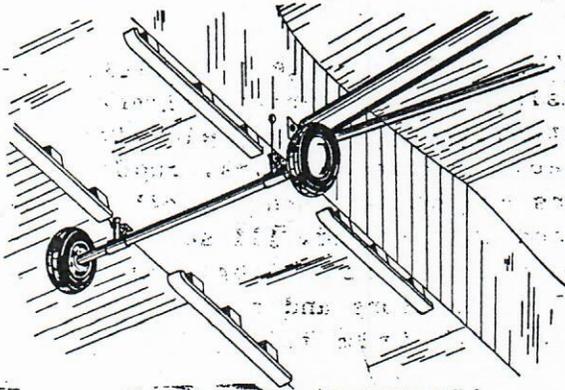


**TAIL WHEEL:** The tail wheel supports the aft portion of the glider and is located about 42 inches from the extremity of the tail section. The tail wheel cannot be steered from the cockpit and when the glider is towed "tail first", the tail wheel should be placed on a towing dolly.

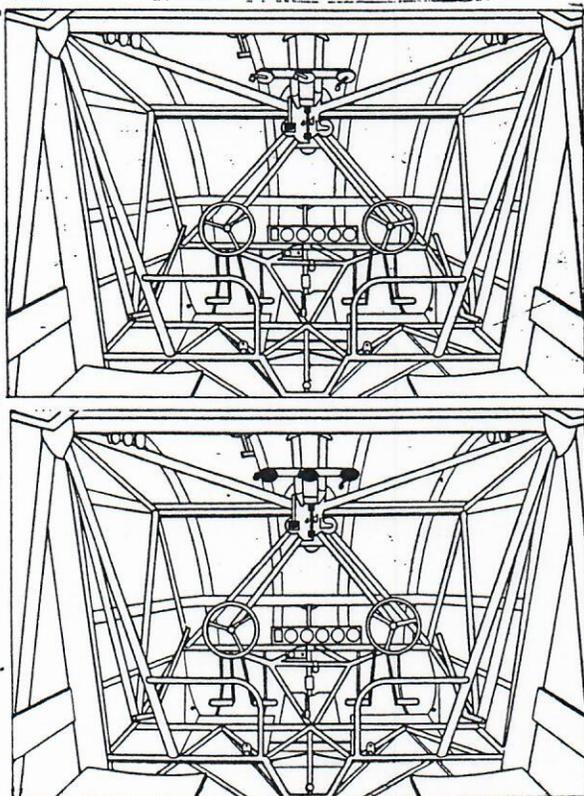
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UNDERCARRIAGE: There are two different types of undercarriages, the first of which is an articulated tripod consisting of a "V" strut and a spring oleo shock absorber. This type gear is mounted on either side of the center section and is fastened with bolts. It is equipped with hydraulic brakes and pneumatic tires, and is referred to as the "training gear."



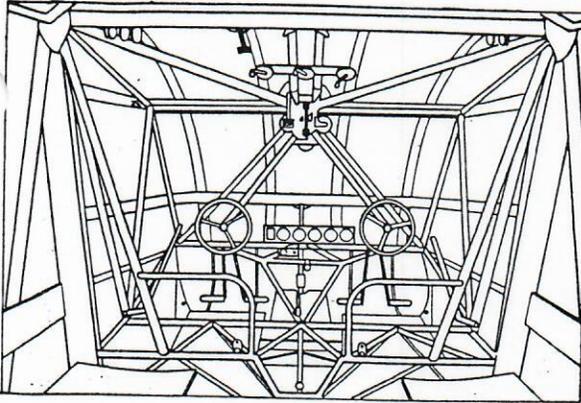
UNDERCARRIAGE: The second type undercarriage is a "tactical" jettisonable gear which may be dropped by the pilot after take-off. This gear consists of a reinforced axle and plain wheels with pneumatic tires. It is not equipped with brakes. A parachute may be attached to this gear before it is dropped.



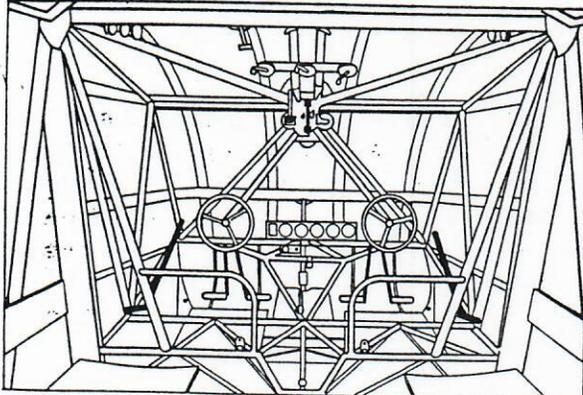
CONTROLS: The central control system consists of dual controls. Control of ailerons and elevators can be obtained by a wheel mounted on an inverted column, which can be swung from the pilot to the co-pilot. Individual rudder pedals are provided, which are adjustable fore and aft. The pilot's pedals are equipped with toe brakes.

TRIM TAB: The trim tabs are cable actuated and controlled by cranks above the pilot's head at the center of the compartment. The operational plate around each crank gives full directions for trimming about the three flight axes.

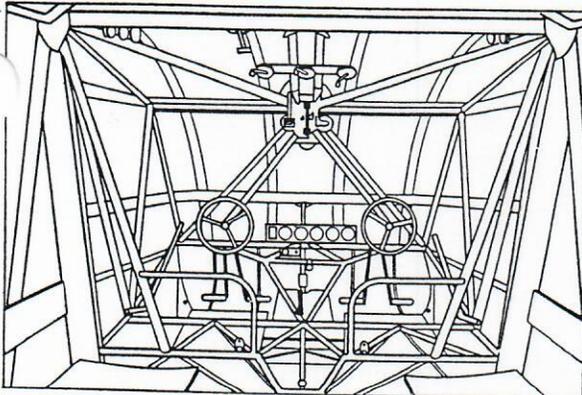
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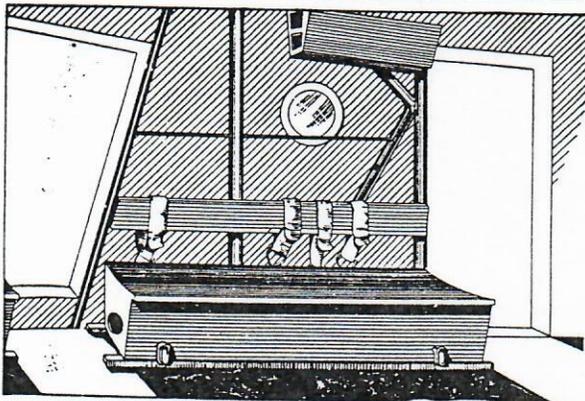
JETTISONABLE GEAR CONTROLS: When the glider has reached a minimum altitude of 400 feet, the pilot may release the tactical gear by pulling an overhead lever marked, "Pull to Drop Take-Off Gear". Upon release the tactical gear is dropped by parachute which is a permanent part of this equipment thus conserving the gear so it may be used again.



SPOILER CONTROLS: At the pilot's left and co-pilot's right are the spoiler levers which, when pulled, extend the spoilers. The spoilers greatly decrease lift, increase the gliding angle, and raise the sinking speed.

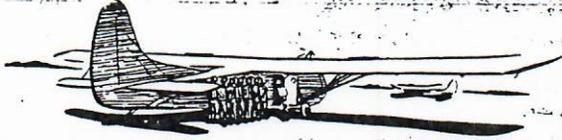


NOSE RELEASE CONTROL: Directly between the pilot and co-pilot is located the nose release lever, which is wired closed during training or while carrying troops. This lever is used to release two latches located in the lower rear corners of the pilot's compartment. It is operated only when necessary to load or unload equipment which cannot pass through the doors located at the rear of the cargo compartment.

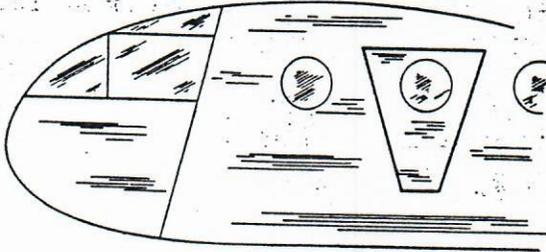


FUSELAGE EQUIPMENT: The fuselage equipment consists of seats, safety belts, tie down fittings, nose lifting mechanism, flight report holder, data case, control lock, load adjuster and battery. The cockpit seats are mounted directly to the framework of the fuselage and are not adjustable.

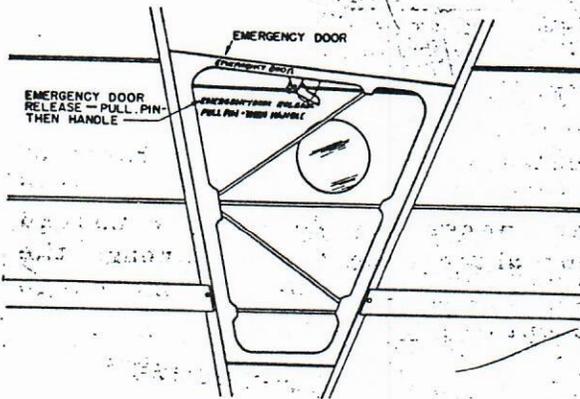
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**TROOP TRANSPORT:** When used as a troop transport, four light weight benches are placed in the cargo compartment (two on either side) to accommodate twelve men. On the port side a single seat is provided to accommodate a thirteenth man. When used for transporting cargo, the seats are removed and the cargo is lashed down to "D" rings in the lower end of the vertical tubing on either side of the floor section.



**EMERGENCY EXIT:** In case it becomes necessary to leave the glider while in the air, or to make a rapid exit upon landing, emergency doors are located midway between the cockpit and entrance doors. These doors may be easily removed by pulling down on the handle and pushing outward.



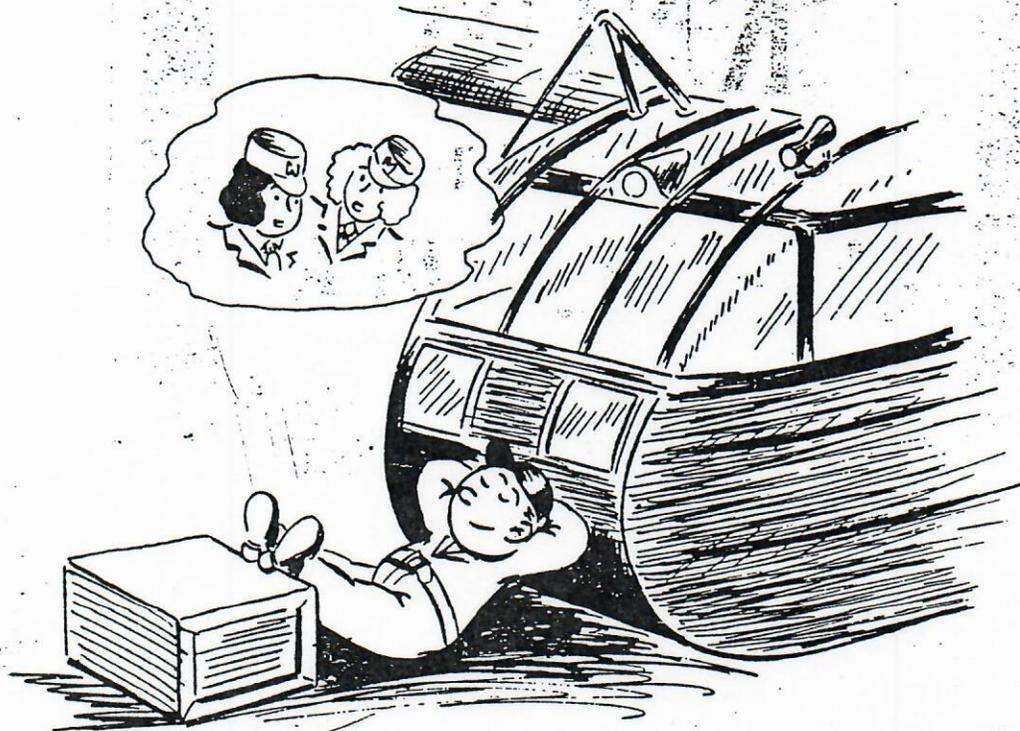
**EMERGENCY PLACARD:** This and all like placards (stenciled) should be read and understood by everyone who rides in the carrier.

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THINGS YOU SHOULD  
**KNOW**  
ABOUT THE  
**CG-4 GLIDER**



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WEIGHT DATA

Gross Weight	7350 lbs.
Weight Empty	3600 lbs.
Useful Load	3750 lbs.
Wing Loading	8.39 lbs./sq. ft.

CAUTION: This ship must not be flown at less load than the following: Pilot and co-pilot. Four passengers or their equivalent weight located on the first two seats, each side, of the cargo compartment.

USEFUL LOAD WEIGHT DATA

Troop Carrier		Lbs.
Crew.....	2 at 240 lbs.	480
Passengers.....	13 at 240 lbs.	3120
Seats, Backs and Safety Belts.....		109
Fixed Landing Gear.....		277
Miscellaneous.....		211
	Useful Load	4197

Cargo Carrier - Jeep

Crew . . . . .	2 at 240 lbs.	480
Passengers . . . . .	4 at 240 lbs.	960
Jeep Car . . . . .		2120
Tie-Down Cables . . . . .		30
Fixed Landing Gear . . . . .		277
Miscellaneous . . . . .		330
	Useful Load	4197

Cargo Carrier - 75 MM. Howitzer

Crew . . . . .	2 at 240 lbs.	480
Passengers . . . . .	3 at 240 lbs.	720
75 MM. Howitzer . . . . .		2090
Ammunition (75 MM) 18 Rounds . . . . .		384
Tie-Down Cables . . . . .		30
Fixed Landing Gear . . . . .		277
Miscellaneous . . . . .		216
	Useful Load	4197

Note: If jettisonable gear is dropped, increase miscellaneous load 277 lbs.; if carried decrease miscellaneous load 109 lbs.

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DIMENSIONS AND AREAS

GENERAL DATA

Span . . . . . 83 ft. 8 in.  
Length (over all) . . . . . 48 ft. 3-3/4 in.  
Length (tail wheel on ground) . . . . . 48 ft. 4-5/8 in.  
Height (reference line level) . . . . . 16 ft. 10-7/8 in.  
Height (tail wheel on ground) . . . . . 12 ft. 7-7/16 in.

WINGS.

Airfoil Section . . . . . NACA 43012  
Chord . . . . . 10 ft. 6 in.  
Incidence . . . . . 0°  
Dihedral . . . . . 1-1/2°

STABILIZER.

Span . . . . . 22 ft. 0 in.  
Chord . . . . . 6 ft. 0 in.  
Incidence . . . . . 0°  
Dihedral . . . . . 0°

FUSELAGE.

Width (cargo compartment) . . . . . 72 in.  
Height . . . . . 65 in.  
Length . . . . . 159 in.

AREAS (SQ. FT.).

Wings (less ailerons) . . . . . 766.1  
Aileron (total) . . . . . 85.4  
Flaps (total) . . . . . None  
Stabilizer (including elevators) . . . . . 114  
Elevators (including tabs) . . . . . 54.6  
Elevator Trim tabs . . . . . 2.42  
Fin (not including dorsal) . . . . . 25.10  
Rudder (including tabs) . . . . . 33.57  
Rudder (tab) . . . . . 1.37  
Aileron trim tab . . . . . .70  
Aileron trim tab . . . . . 4.30  
Spoiler (total) . . . . . 4.06

SETTINGS AND RANGES OF MOVEMENTS  
OF CONTROL SURFACES

Stabilizer . . . . . fixed  
Find . . . . . fixed

AILERONS.

Up-travel . . . . . 8 3/4 in. (20°)  
Down-travel . . . . . 11 3/4 in. (25°)

ELEVATORS.

Up-travel . . . . . 12 3/16 in. (25°)

RUDDER

Right . . . . . 17 1/2 in. (23°)  
Left . . . . . 17 1/2 in. (23°)

ELEVATOR TAB.

Up-travel . . . . . 1 3/8 in. (16°)  
Down-travel . . . . . 7/8 in. (8°)

RUDDER TAB.

Left . . . . . 1 3/4 in. (10-1/2°)  
Right . . . . . 1 3/4 in. (10-1/2°)

AILERON TABS.

Up-travel . . . . . 1 7/16 in. (16°)  
Down-travel . . . . . 2 1/4 in. (24°)

ALIGHTING GEAR

TRAINING GEAR.

MAIN GEAR.

Type . . . . . Non-retractable

Tread . . . . . 140 in.

SHOCK STRUTS.

Type . . . . . Spring-011

Make and part number . . . . . Waco No. 28806

FLUID REQUIRED.

AAF Specification Number . . . . . 3580 (Red)

British Equivalent . . . . . Spec. D.Y.D.44D

WHEELS (Main)

Type . . . . . Hayes Alum. 27 in.

Part number . . . . . No. 25258

Tires . . . . . 27 in. 8-Ply Rayon

Tubes . . . . . 27 in. heavy duty

Tire Pressure . . . . . 45 lbs./sq. in.

BRAKES

Type (AAF Spec. No. 3586-C) . . . . . Hydraulic

Part number . . . . . Hayes G-297

TAIL WHEEL UNIT

Type . . . . . Non-retractable

SHOCK STRUT.

Type . . . . . Rubber disc

Make and part number . . . . . No. 29418 Waco

WHEEL

Type . . . . . Fiber

TACTICAL GEAR

Type . . . . . Droppable

Tread . . . . . 112 in.

Shock struts . . . . . None

WHEELS (same as fixed gear).

Type . . . . . Hayes Alum. 27 in.

Part Number . . . . . No. 25258-1

Tires . . . . . 27 in. 8-Ply Rayon

Tubes . . . . . 27 in. heavy duty

Tire pressure . . . . . 45 lbs./sq. in.

Brakes . . . . . None

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REF ID: A6371

CONTROL CABLE CHART

<u>Name</u>	<u>Pounds of Tension</u>	<u>Dia. Strand</u>	<u>"L"</u>
Aileron Control-Fuselage	65	5/32 7 x 19	17'-2-1/2"
Aileron Control-Fuselage	65	5/32 7 x 19	19'-5"
Aileron Control-Wing	65	5/32 7 x 19	27'-3-3/4"
Aileron Control-Wing	65	5/32 7 x 19	29'-11-1/2"
Elevator Control	100	5/32 7 x 19	20'-0"
Rudder Control-Nose	15-20	1/8 7 x 19	3'-4-1/2"
Rudder Control-Nose	15-20	1/8 7 x 19	5'-7-5/8"
Rudder Control-Fuselage	15-20	1/8 7 x 19	22'-4-5/8"
Spoiler-R, Fuselage	Free of Slack	1/8 7 x 19	13'-11-3/4"
Spoiler-L, Fuselage	Free of Slack	1/8 7 x 19	9'-8"
Brakes-L	Free of Slack	1/8 7 x 19	11'-8"
Brakes-R	Free of Slack	1/8 7 x 19	14'-9-1/2"
Spoiler-Fuselage	Free of Slack	1/8 7 x 19	6'-4-1/2"
Spoiler Control	Free of Slack	1/8 7 x 19	10'-0-3/4"
Aileron Tab-Wing	15-20	1/8 7 x 19	25'-0"
Aileron Tab-Fuselage	15-20	3/32 7 x 7	46'-1-1/2"
Rudder Tab	15-20	3/32 7 x 7	6'-0-1/2"
Elevator Tab	15-20	3/32 7 x 7	5'-0-5/16"
Spoiler, Wing-Fuselage	Free of Slack	1/8 7 x 19	3'-4-1/4"
Skid--Front	55	3/16 7 x 19	25 1/16"
Skid--Front	55	3/16 7 x 19	25 15/16"
Skid--Rear	55	3/16 7 x 19	22 15/16"
Nose Latch	Free of Slack	3/32 7 x 7	3'-5"
Take-off Gear Release	Free of Slack	3/32 7 x 7	12'-0"
Take-off Gear Release	Free of Slack	3/32 7 x 7	14"
Hold-down-Front	As necessary	3/16 7 x 19	38'-3/4"
Hold-down-Rear	As necessary	1/8 7 x 19	53'-1/4"
Nose Raising Cable	Free of Slack	1/4 7 x 19	8'-10-1/2"
Nose Raising Cable	Free of Slack	1/4 7 x 19	8'-9"
Rudder Control	15-22	1/8 7 x 19	10'-3/4"
Trip Cable	Free of Slack	1/8 7 x 19	42'-3/16"
Snubber	Free of Slack	1/8 7 x 19	8'-11-3/4"
Rudder Buss	15-22	3/32 7 x 7	2'-11"
Elevator Control-Front	100	5/32 7 x 7	21'-4-3/4"
Elevator Control-Front	100	5/32 7 x 7	19'-10-5/8"

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STRETCHING AND BREAKING POINT OF  
EXTRA-FLEXIBLE CABLE

7 x 19 Galvanized

Diameter in inches	Stretching * point	Minimum Breaking Point
1/8	1200	2000
5/32	1680	2800
3/16	2520	4200
7/32	3360	5600
1/4	4200	7000
9/32	4800	8000
5/16	5880	9800

7 x 7 Galvanized

Diameter in inches	Stretching * point	Minimum Breaking Point
3/32	552	920
7/64	582	970
1/8	710	1350
5/32	1560	2600
3/16	1920	3200
7/32	2760	4600
1/4	3480	5800
9/32	4320	7200
5/16	5520	9200

\* Stretching point is 60% of breaking point.



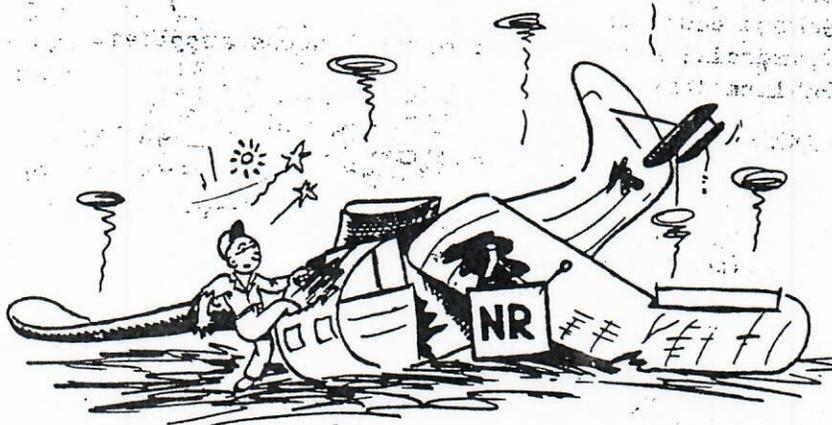
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STATUS CODE

The status of each article listed in a stock list is indicated by means of a code letter as follows:

(1) Status code is employed to designate the status of articles as to procurement, storage, issue and expendability.

X	Experimental.
ST	Service test.
LP	Limited procurement.
S	Standard.
SS	Substitute standard.
LS	Limited standard.
OB	Obsolete.
NS	Non-standard.
NX	Non-expendable.
R	Recoverable.
NR	Non-recoverable.
EXCESS	Not reclaimable



## PROPERTY CLASSES

Army Air Forces equipment and supplies are divided into the following property classes for each of which one or more stock lists are provided:

- 01 Airplanes and spare parts.
- 02 Engines and spare parts.
- 03 Aircraft accessories.
- 04 Aircraft hardware and rubber materials.
- 05 Aircraft instruments and laboratory test equipment.
- 06 Fuels and lubricants.
- 07 Dopes, paints, and related materials.
- 08 Electrical equipment and supplies.
- 10 Photographic equipment and supplies.
- 11 Aircraft combat material.
- 12 Fuel and lubricating equipment and supplies.
- 13 Clothing, parachutes, equipment and supplies.
- 14 Hangars and other demountable buildings and parts.
- 16 Balloon equipment and supplies.
- 17 Machinery, shop equipment and tools.
- 18 Special tools.
- 19 Flying field and hangar equipment.
- 21 Cordage, fabrics and leathers.
- 22 Woods.
- 23 Metal and composition material.
- 24 Chemicals.
- 25 Office equipment and supplies.
- 26 School equipment.
- 29 Commercial hardware and miscellaneous supplies.
- 30 Publications.



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INSIGNIA AND CAMOUFLAGE COLOR CHART

Dark Olive Drab	No. 41
Medium Green	No. 42
Neutral Gray	No. 43
Black	No. 44
Insignia Red	No. 45
Insignia White	No. 46
Insignia Blue	No. 47
Identification Yellow	No. 48
Sand	No. 49

DURN! I THOUGHT THAT  
FIRE PLUG WAS HERE SOMEWHERE!



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NONSTRUCTURAL TUBING.

THE FOLLOWING TUBING IS USED FOR INSTRUMENT AND BRAKE INSTALLATIONS.

NAME OR LOCATION	PART NO.	MATERIAL	SIZE	LENGTH	END FITTING
PITOT - (Pressure)	29053-1	COPPER	1/4 x .035	76	AN 817-4D
PITOT - (Pressure)	29053-2	COPPER	1/4 x .035	42 1/2	AN 817-4D
PITOT - (STATIC)	29053-1	COPPER	1/4 x .035	76	AN 817-4D
PITOT - (STATIC)	29053-3	COPPER	1/4 x .035	24 3/4	AN 817-4D
PITOT - (STATIC)	29053-4	COPPER	1/4 x .035	5 3/4	AN 817-4D
PITOT - (STATIC)	29053-5	COPPER	1/4 x .035	8 1/8	AN 817-4D
VENTURI	29370	AL. ALLOY	3/8 x .049	78	AN 817-6
BRAKE LINE	29055-1	AL. ALLOY	5/16 x .032	54	95-015
BRAKE RESERVOIR	26224-3	AL. ALLOY	5/16 x .032	18	AN 817-4 Weatherhead 105 x 4
B LINE	28842-1	COPPER	5/16 x .032	24 1/2	95-015 and 817-5



MARKING OF UNITED STATES  
AIRCRAFT LINES

NAME OF LINE

COLOR BANDING

Anti-Icing  
 Prestone  
 Water  
 Fire Extinguisher  
 Fuel  
 Hydraulic Pressure, Oil  
 Oil (lubricating)  
 Oxygen  
 Pitot Pressure:  
   Air speed  
   Altimeter  
   Climb Indicator  
     (Pitot Impact)

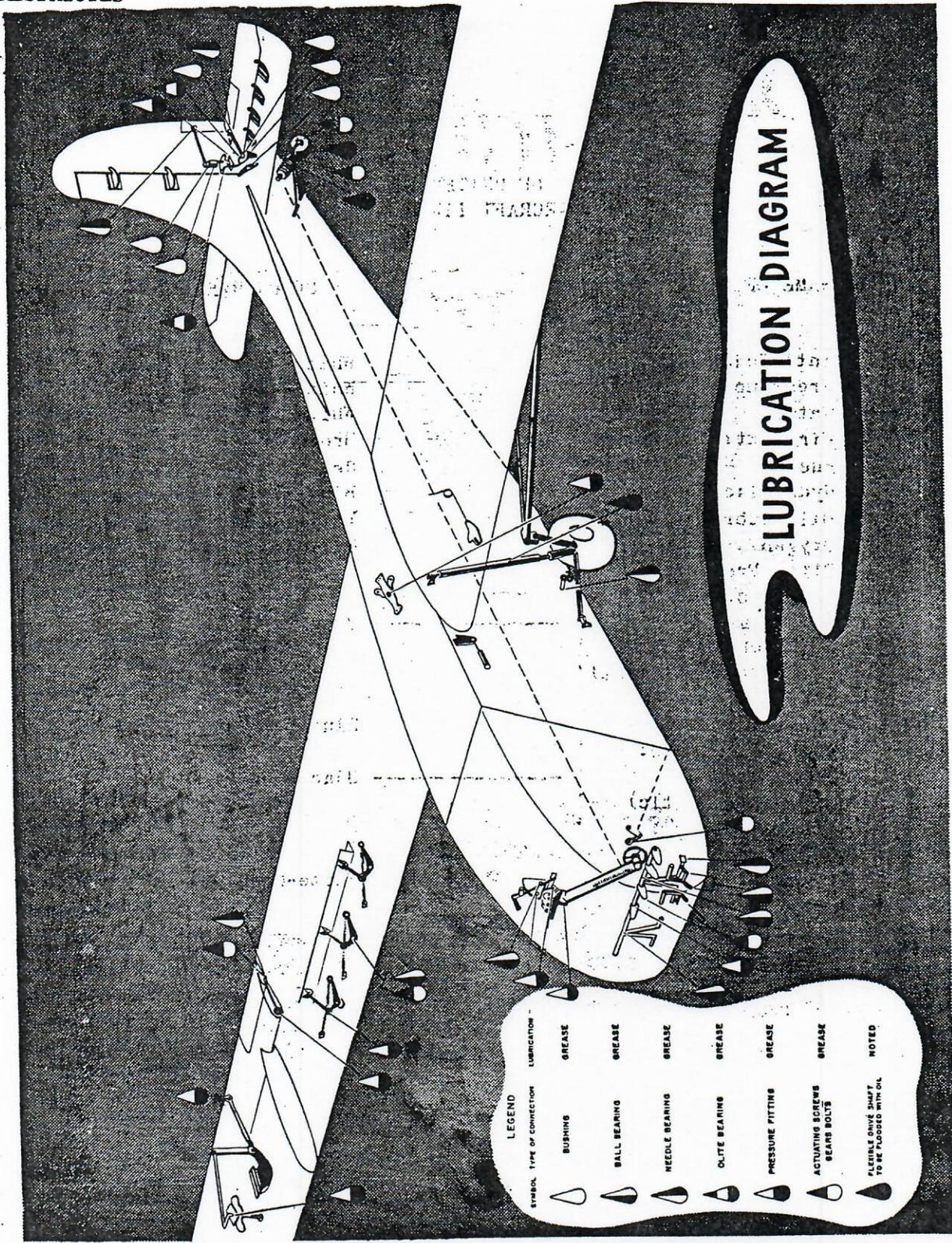
White--Red  
 White--Black--White  
 White  
 Brown  
 Red  
 Blue--Yellow-Blue  
 Yellow  
 Green

Purging System  
 Static Pressure:  
   Air Speed  
     (Pitot Static)

Blue-Yellow  
 Black--Green

Vacuum

White-Green



LUBRICATION DIAGRAM

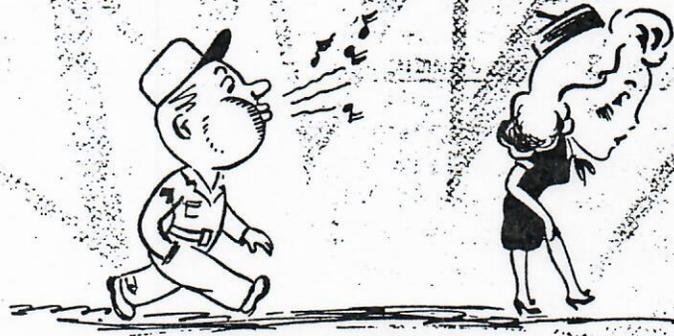
SYMBOL	TYPE OF CONNECTION	LUBRICATION
	BUSHING	GREASE
	BALL BEARING	GREASE
	NEEDLE BEARING	GREASE
	OLITE BEARING	GREASE
	PRESSURE FITTING	GREASE
	ACTUATING SCREWS GEAR BOLTS	GREASE
	PLACES SHOWN MUST TO BE FLOODED WITH OIL	NOTED

RESTRICTED

# PREFLIGHT INSPECTION



NOTICE



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RESTRICTED



Flight Report Before take off the glider pilot shall satisfy himself that all maintenance on the glider has been properly accomplished. Upon completion of this visual check the flight report is noted and signed.

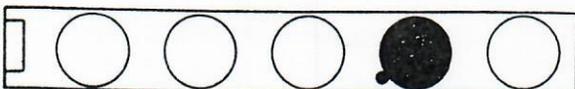
Airspeed Indicator The pointer of the airspeed indicator is set to zero provided there is no wind. If there is a wind the value should be determined from the ground station and correct computations made on the indicator.



Rate of Climb Indicator The rate of climb indicator is calibrated in 1000 feet per minute ascent and descent. This instrument is checked for zero setting of the indicator hand.

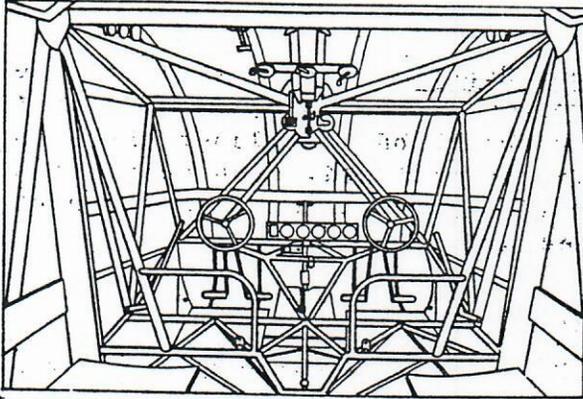


Altimeter Setting of the glider altimeter should coincide with the altimeter setting in the tow plane and is accomplished by turning the knurled setting knob. A slight vibration of the instrument is desirable while setting to eliminate friction. Ascertain the availability of the altimeter correction card.



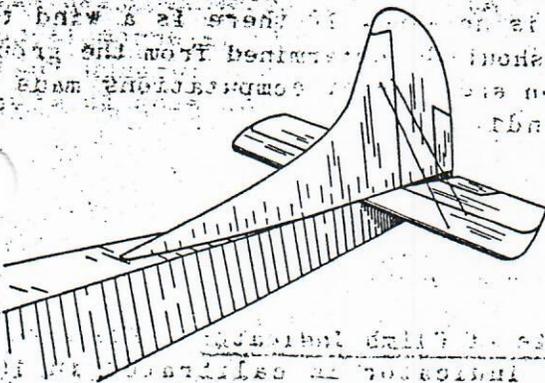
RESTRICTED

RESTRICTED



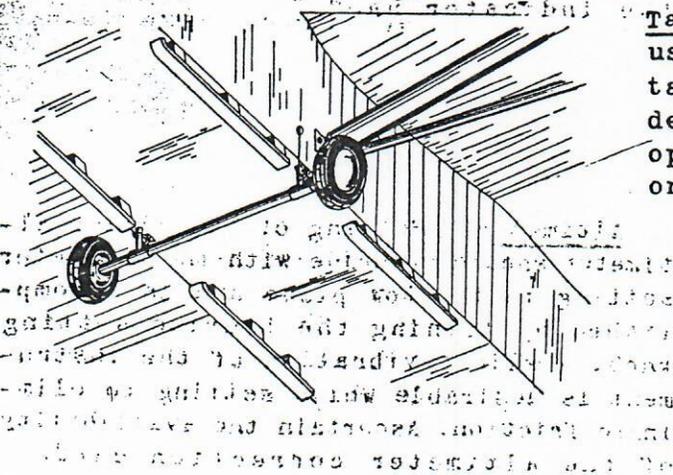
**Nose Lock and Release:** The pilot will personally check the nose locks and determine whether they are properly engaged. He will also check the positions of the release handle - it should be safetied in lock position.

The pointer of the  
 indicator should be set to zero  
 position. The pointer is a  
 hand that is attached to the  
 indicator and moves as the  
 engine speed changes.

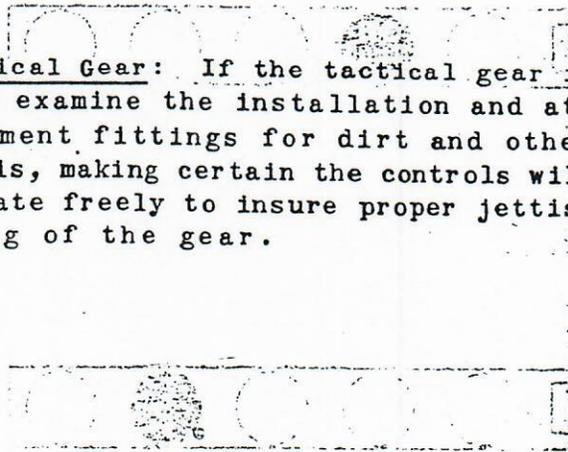


**Alignment of Brace Wire:** The alignment of the empennage brace wires and fittings should be checked. The tension of the wires may be tested by snapping with the fingers to produce a vibratory sound. A slight pull on the wire near the fitting will determine the security of the fitting and its attachment.

The installation of tactical gear  
 should be checked for proper  
 alignment and clearance. The  
 gear should be checked for  
 proper operation and  
 safety.



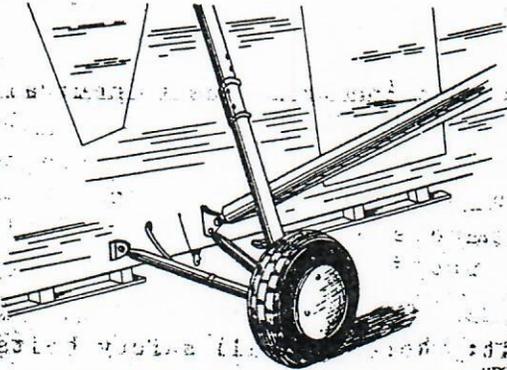
**Tactical Gear:** If the tactical gear is used examine the installation and attachment fittings for dirt and other debris, making certain the controls will operate freely to insure proper jettisoning of the gear.



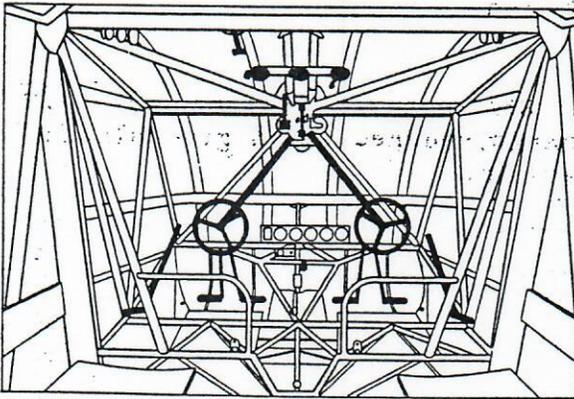
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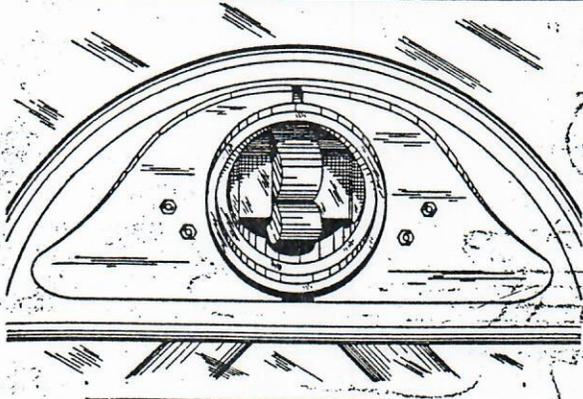
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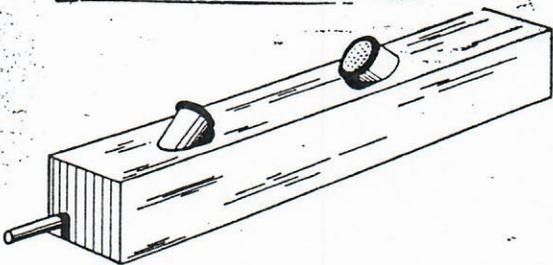
Training Gear: If a training gear is used, the brakes should be worked several times to insure proper and positive action. This may be accomplished by having the crew push the glider a few feet and then applying the brakes.



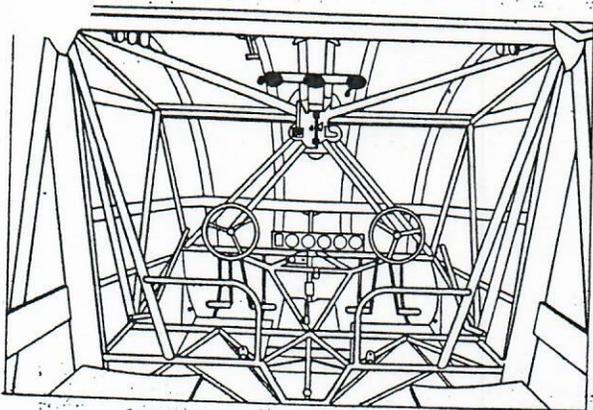
Controls: Check all control surfaces to determine whether the external locks have been removed. After this is accomplished the controls are operated through their full range of travel from stop to stop.



Tow Line: Engage and disengage the tow line mechanism several times, special attention should be given the indicator pin which should be flush with the housing of the release mechanism. This insures complete closure of the release jaws.



Radio: Turn the radio "on" and "off" several times and contact the tow plane or control tower. Ascertain satisfactory reception, selection and volume control.



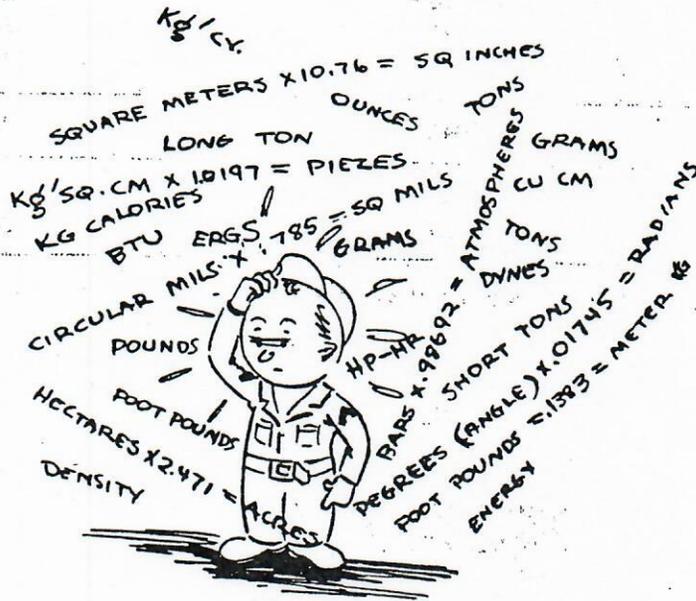
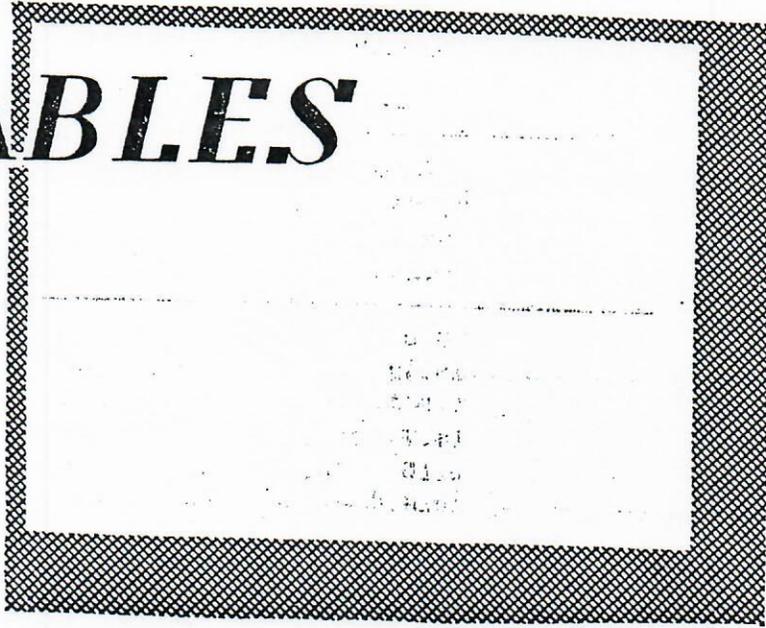
Trim Tabs: Set the trim tabs to neutral.

Safety Belt: Note that all safety belts are fastened.

Take Off: See that all doors are closed, crew or cargo secured, then give signal for take off.



# TABLES



CONVERSION FACTORS

PRESSURE

Multiply	By	To Obtain
Pounds/sq. in.	.06804	Atmospheres
	2.036	In. of mercury
	703.1	Kg/sq. meter
	70.31	Grams/sq. cm.
Atmospheres	76.0	Cm. of mercury
	29.92	In. of mercury
	1.033	Kg/sq. cm.
	14.7	Pounds/sq. in.
	2116	Pounds/sq. ft.
	1013.2	Millibars
Pounds/sq. ft.	.19242	In. of water
	4.883	Kg/sq. meter
Inches of water	.07349	In. of mercury
	25.38	Kg/sq. meter
	5.198	Pounds/sq. ft.
Kg/sq. meter	.2048	Pounds/sq. ft.
Kg/sq. cm.	1.0197	Piezes
	14.22	Pounds/sq. in.

\* Based on water at 15°C and mercury at 0°C.



CONVERSION FACTORS

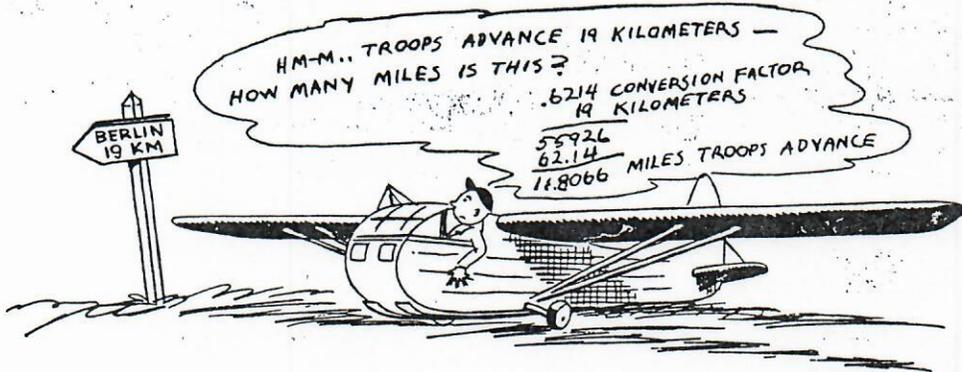
AREA

Multiply	By	To Obtain
Square inches	6.452	Sq. cm.
Square feet	929	Sq. cm.
	144	Sq. inches
	.09290	Sq. meters
	.111	Sq. yards
Square yards	9	Sq. feet
	.8361	Sq. meters
Square miles	640	Acres
	2.590	Sq. km.
Square cm.	.1550	Sq. inches
Square meters	10.76	Sq. feet
	1.196	Sq. yards
Square km.	.3861	Sq. miles
Hectares	2.471	Acres
Acres	43560	Sq. feet
Circular mils.	.785	Sq. mil.
	$7.85 \times 10^{-7}$	Sq. inches
	$5.067 \times 10^{-6}$	Sq. cm.



CONVERSION FACTORS

Multiply	By	To Obtain
Inches	2.540	Centimeters
	1000	Mils.
Feet	30.48	Centimeters
	12	Inches
	.3048	Meters
	0.333	Yards
Yards	3	Feet
	.9144	Meters
Miles	5280	Feet
	1.609	Kilometers
	1760	Yards
	.8684	Naut. miles
Centimeters	.3937	Inches
Meters	39.37	Inches
	3.281	Feet
	1.094	Yards
Kilometers	3281	Feet
	.6214	Miles
	1094	Yards
Degrees (Angle)	.01745	Radians



CONVERSION FACTORS

Multiply	By	To Obtain
Feet/min.	.01667	Feet/sec.
	.01136	Miles/hr.
Feet/sec.	1.097	Km/hr.
	.5921	Knots
	.6818	Miles/hr.
Miles/hr.	.447	Meters/sec.
	1.467	Feet/sec.
	1.609	Km/hr.
	.8684	Knots
Knots	1.689	Feet/sec.
	1.853	Km/hr.
	1.152	Miles/hr.
	.5148	Meters/sec.
Km/hr.	.9113	Feet/sec.
	.5396	Knots
	.6214	Miles/hr.
	.2778	Meters/sec.
Meters/sec.	3.281	Feet/sec.
	3.6	Km/hr.
	2.237	Miles/hr.
Rpm	.1047	Radians/sec.



CONVERSION FACTORS

Volume

Multiply	By	To Obtain
Cu inches	16.39 .01732	Cu cm Quarts
Cu feet	1728 .02832 .03704 7.48052 28.32	Cu inches Cu meters Cu yards U.S. gal Liters
Cu yards	27 .7646 202	Cu feet Cu meters U.S. gal
U.S. gal, liquid	.1337 231 4	Cu feet Cu inches U.S. quarts
Quarts	2	Pints
Barrels-oil	42	Gallons-oil
S. gal, dry	1.164 .83267 3.785	U.S. gal liquid Imperial gal Liters
Imperial gal	1.201 4.546 277.4	U.S. gal Liters Cu inches

Liters	.03531 61.02 .2642	Cu feet Cu inches U.S. gal
Cu meters	35.31 1.308 264.2	Cu feet Cu yards U.S. gal



MORAL: THE IMPERIAL GALLON IS EQUAL TO 1.201 U.S. GALLONS.

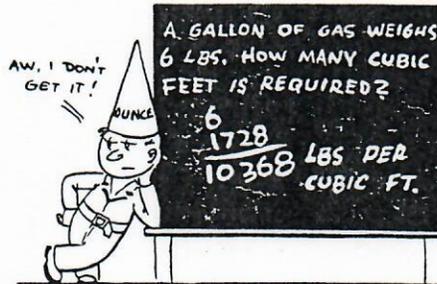
CONVERSION FACTORS

Density

Multiply	By	To Obtain
Pounds	27.68 27680 1728	Grams/cu cm Kg/cu meter Pounds cu ft
Pounds/cu ft	.01602 16.02	Grams/cu cm Kg/cu meter
Grams/cu cm	62.46 .03613 1000	Pounds/cu ft Pounds/cu in Kg/cu meter
Kg/cu meter	.0624	Pounds cu ft

Energy

Hp-hr	2545 641.7	Btu Kg cal.
Kg calories	3.968 3086 426.9	Btu Foot-lb Meter kg
Foot-pounds	.1383	Meter kg
Meter kg	7.233	Foot-lb
Btu	777.98	Foot-lb
Ergs	$7.376 \times 10^{-8}$	Foot-pounds



CONVERSION FACTORS

Multiply	Weight By	To Obtain
Ounces (avdp)	.0625 437.5 28.35 .9115	Pounds (avdp) Grains Grams Ounces (troy)
Pounds (avdp)	16 7000 .454 1.21528	Ounces (avdp) Grains Kilograms Pounds (troy)
Tons (short)	2000 907.18 .90718	Pounds (avdp) Kilograms Tons (metric)
Tons (long)	2240 1016	Pounds (avdp) Kilograms
Tons (metric)	1000 2205 1.1025	Kilograms Pounds (avdp) Tons (short)
grams	2.205	Pounds
Grams	980.7	Dynes
Dynes	$2.248 \times 10^{-6}$	Pounds
Pounds/hp	.459	Kg/cv

WHEN IS A TON NOT A TON.... DON'T YOU GET IT? WHEN ITS A SHORT ONE!!



DECIMAL FRACTION CONVERSION

<u>INCH FRACTION CONVERSION</u>	<u>DECIMAL EQUIV.</u>	<u>INCH FRACTION CONVERSION</u>	<u>DECIMAL EQUIV.</u>
1/64.....	.0156	29/64.....	.4531
1/32.....	.0312	15/32.....	.4687
3/64.....	.0469	31/64.....	.4844
1/16.....	.0625	1/2.....	.5
5/64.....	.0781	33/64.....	.5156
3/32.....	.0937	17/32.....	.5312
7/64.....	.0194	35/64.....	.5469
1/8.....	.125	9/16.....	.5625
9/64.....	.1406	37/64.....	.5781
5/32.....	.1562	19/32.....	.5937
11/64.....	.1719	39/64.....	.6094
3/16.....	.1875	5/8.....	.625
13/64.....	.2031	41/64.....	.6406
7/32.....	.2187	21/32.....	.6562
15/64.....	.2344	43/64.....	.6719
1/4.....	.25	11/16.....	.6875
17/64.....	.2656	45/64.....	.7031
9/32.....	.2812	23/32.....	.7187
19/64.....	.2969	47/64.....	.7344
5/16.....	.3125	3/4.....	.75
21/64.....	.3281	49/64.....	.7656
11/32.....	.3437	25/32.....	.7812
23/64.....	.3594	51/64.....	.7969
3/8.....	.375	13/16.....	.8125
25/64.....	.3906	53/64.....	.8281
13/32.....	.4062	27/32.....	.8437
27/64.....	.4219	55/64.....	.8594
7/16.....	.4375		

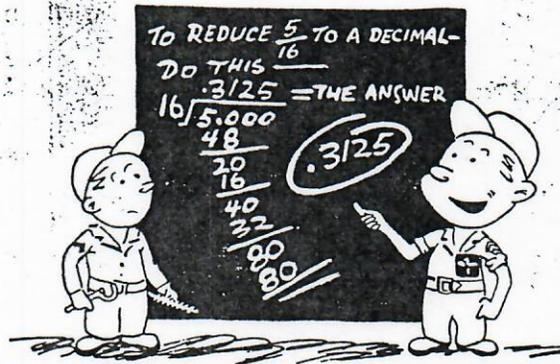
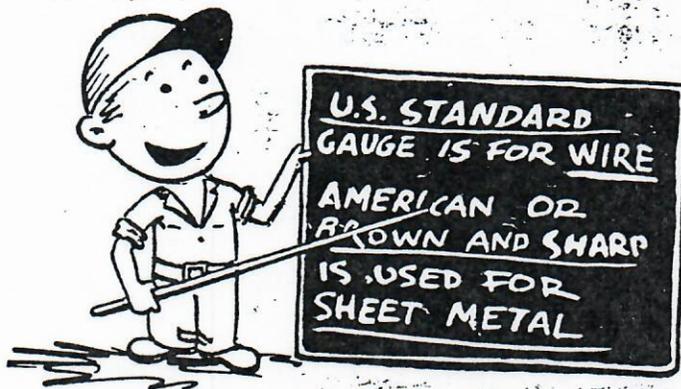


TABLE OF STANDARD WIRE GAUGES

GA. NO.	AMERICAN OR BROWN & SHARP	U. S. STANDARD	GA. NO.	AMERICAN OR BROWN & SHARP	U. S. STANDARD
6/0	.5800	.4687	17	.0452	.0562
5/0	.5165	.4375	18	.0403	.0500
4/0	.4600	.4062	19	.0359	.0437
3/0	.4096	.3750	20	.0319	.0375
2/0	.3648	.3437	21	.0284	.0343
1/0	.3249	.3125	22	.0253	.0312
1	.2893	.2812	23	.0225	.0281
2	.2576	.2656	24	.0201	.0250
3	.2294	.2500	25	.0179	.0218
4	.2043	.2343	26	.0159	.0187
5	.1819	.2187	27	.0142	.0171
6	.1620	.2031	28	.0126	.0156
7	.1443	.1875	29	.0112	.0140
8	.1285	.1718	30	.0100	.0125
9	.1144	.1562	31	.0089	.0109
10	.1019	.1406	32	.0079	.0101
11	.0907	.1250	33	.0071	.0093
12	.0808	.1093	34	.0063	.0085
13	.0719	.0937	35	.0056	.0078
14	.0640	.0781	36	.0050	.0070
15	.0570	.0703	37	.0044	.0066
16	.0508	.0625	38	.0039	.0062

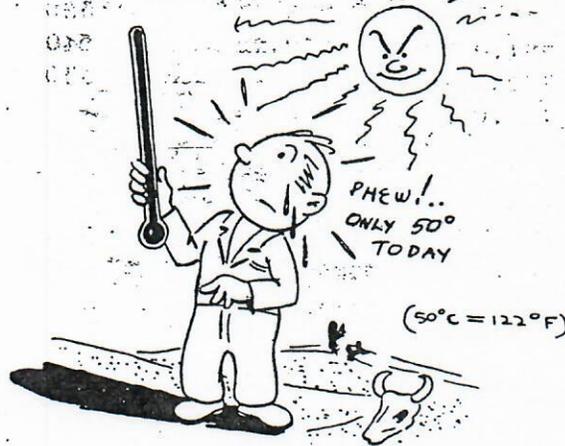


Temperature Conversion Table  
Centigrade-Fahrenheit

$^{\circ}\text{F} = 9/5^{\circ}\text{C} + 32 = 1.8 (^{\circ}\text{C} + 17.8)$   
 $^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$

Resultant $^{\circ}\text{C}$	Given Temperature		Resultant $^{\circ}\text{F}$	Resultant $^{\circ}\text{C}$	Given Temperature		Resultant $^{\circ}\text{F}$
	$^{\circ}\text{C}$	in or $^{\circ}\text{F}$			$^{\circ}\text{C}$	in or $^{\circ}\text{F}$	
-51.1	-60		-76.0	26.67	80	176.0	
-45.5	-50		-58.0	29.44	85	185.0	
-40.0	-40		-40.0	32.22	90	194.0	
-34.4	-30		-22.0	35.00	95	203.0	
-31.7	-25		-13.0	37.78	100	212.0	
-28.9	-20		- 4.0	40.56	105	221.0	
-26.1	-15		+ 5.0	43.33	110	230.0	
-23.3	-10		14.0	46.11	115	239.0	
-20.6	- 5		23.0	48.89	120	248.0	
-17.8	0		32.0	51.67	125	257.0	
-15.0	5		41.0	54.44	130	266.0	
-12.22	10		50.0	57.22	135	275.0	
- 9.44	15		59.0	60.00	140	284.0	
- 6.67	20		68.0	65.56	150	302.0	
- 3.89	25		77.0	71.11	160	320.0	
- 1.11	30		86.0	76.67	170	338.0	
1.67	35		95.0	82.22	180	356.0	
4.44	40		104.0	87.78	190	374.0	
7.22	45		113.0	93.33	200	392.0	

(Continued on Page 44)



Temperature Conversion Table  
Centigrade-Fahrenheit

(Continued from Page 43)

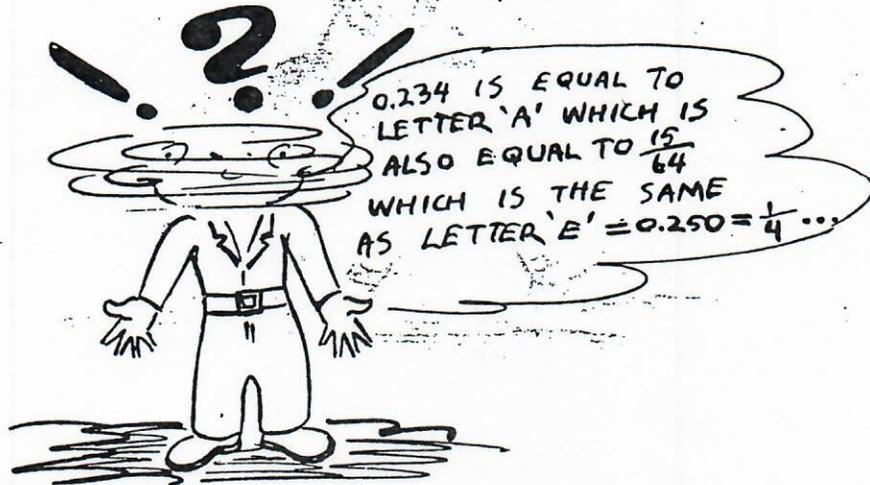
$$^{\circ}\text{F} = 9/5^{\circ}\text{C} + 32 = 1.8 (^{\circ}\text{C} + 17.8)$$

$$^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$$

Resultant °C	Given Temperature		Resultant °F	Resultant °C	Given Temperature		Resultant °F
	°C	in or °F			°C	in or °F	
10.00		50	122.0	98.89		210	410.0
12.78		55	131.0	104.44		220	428.0
15.56		60	140.0	110.00		230	446.0
18.33		65	149.0	115.56		240	464.0
21.11		70	158.0	121.11		250	482.0
23.90		75	167.0	126.67		260	500.0
132.22		270	518.0	215.56		420	788.0
137.78		280	536.0	221.11		430	806.0
143.33		290	554.0	226.67		440	824.0
148.89		300	572.0	232.22		450	842.0
.44		310	590.0	237.78		460	860.0
.00		320	608.0	243.33		470	878.0
165.56		330	626.0	248.89		480	896.0
171.11		340	644.0	254.44		490	914.0
176.67		350	662.0	260.00		500	932.0
182.22		360	680.0	265.56		510	950.0
187.78		370	698.0	271.11		520	968.0
193.33		380	716.0	276.67		530	986.0
198.89		390	734.0	282.22		540	1004.0
204.44		400	752.0	287.78		550	1022.0
210.00		410	770.0				

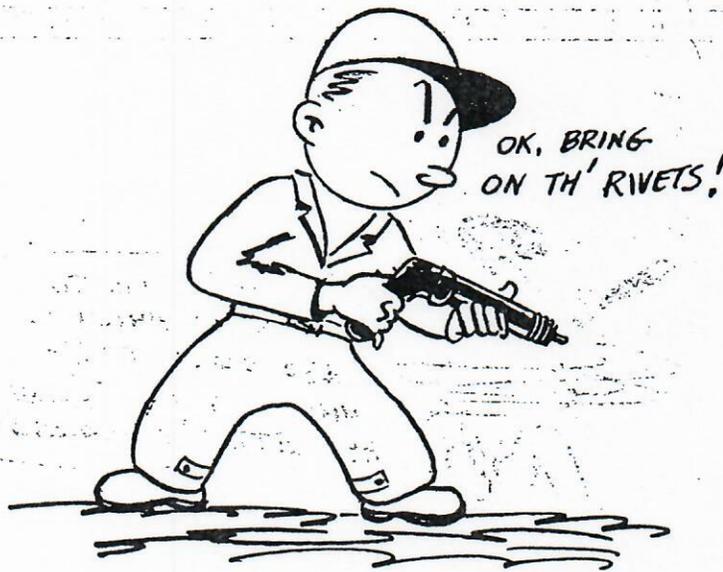
DRILL SIZES FOR TAPER PINS

Dia. of Pin at Large End	Size Of Pin	Length of Pin							
		3/4"		1-1/2"		2-1/4"		3"	
		Drill Size		Drill Size		Drill Size		Drill Size	
Dia.	No.	No.	Dia.	No.	Dia.	No.	Dia.	No.	Dia.
.072	000000	55	.052	63	.037				
.092	00000	49	.073	53	.060				
.108	0000	43	.089	49	.073				
.125	000	36	.107	43	.089		5/64		
.141	00	31	.120		7/64	43	.089		
.156	0	29	.136	31	.120	36	.107		
.172	1	24	.152	29	.136		1/8"	37	.104
.193	2	17	.173	22	.157	27	.144		1/8
.219	3	8	.199	14	.182	18	.170		5/32
.250	4	1	.228	3	.213	7	.201	14	.182
.289	5	H	.266	E	.250	B	.238		7/32
.341	6	0	.316	N	.302		9/32"	H	.266



DRILL SIZES FOR RIVETS

Size	Drill	
	No.	Diameter
1/16"	51	.067
3/32"	40	.098
1/8"	30	.1285
5/32"	21	.159
3/16"	11	.191
1/4"		17/64"
5/16"		21/64"
3/8"		25/64"



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Decimal Equivalent of Drill Sizes

Size	Decimal Equivalent	Size	Decimal Equivalent	Size	Decimal Equivalent
1/2	0.500	3	0.213	3/32	0.093
31/64	0.484	4	0.209	42	0.093
15/32	0.468	5	0.205	43	0.089
29/64	0.453	6	0.204	44	0.086
7/16	0.437	13/64	0.203	45	0.082
27/64	0.421	7	0.201	46	0.081
Z	0.413	8	0.199	47	0.078
13/32	0.406	9	0.196	5/16	0.078
Y	0.404	10	0.193	48	0.076
X	0.397	11	0.191	49	0.073
25/64	0.390	12	0.189	50	0.070
W	0.386	3/16	0.187	51	0.067
V	0.377	13	0.185	52	0.063
3/8	0.375	14	0.182	1/16	0.062
U	0.368	15	0.180	53	0.059
23/64	0.359	16	0.177	54	0.055
T	0.358	17	0.173	55	0.052
S	0.348	11/64	0.171	3/64	0.046
11/32	0.343	18	0.169	56	0.046
R	0.339	19	0.166	57	0.043
Q	0.332	20	0.161	58	0.042
21/64	0.328	21	0.159	59	0.041
P	0.323	22	0.157	60	0.040
O	0.316	5/32	0.156	61	0.039
5/16	0.312	23	0.154	62	0.038
N	0.302	24	0.152	63	0.037
19/64	0.296	25	0.149	64	0.036
M	0.295	26	0.147	65	0.035
L	0.290	27	0.144	66	0.033
9/32	0.281	9/64	0.140	1/32	0.031
K	0.281	28	0.140	67	0.032
J	0.277	29	0.136	68	0.031
I	0.272	30	0.128	69	0.029
H	0.266	1/8	0.125	70	0.028
17/64	0.265	31	0.120	71	0.026
G	0.261	32	0.116	72	0.025
F	0.257	33	0.113	73	0.024
E-1/4	0.250	34	0.111	74	0.022
D	0.246	35	0.110	75	0.021
C	0.242	7/64	0.109	76	0.020
B	0.238	36	0.106	77	0.018
15/64	0.234	37	0.104	1/64	0.015
A	0.234	38	0.101	78	0.016
1	0.228	39	0.099	79	0.014
2	0.221	40	0.098	80	0.013
7/32	0.218	41	0.096	--	--

RESTRICTED

CLEARANCE DRILLS AND COTTER HOLES FOR BOLTS AND STUDS

Size bolt or stud.	Clearance drill for bolts and studs	Drill for Cotter	
		Drill Size or No.	Cotter to be used
#0	#52 (.064)		
#2	5/64 (.078)		
#2	#42 (.094)		
#3	#31 (.106)		
#4	#31 (.120)		
#5	#29 (.136)		
#6	#24 (.152)		
#8	#15 (.180)		
#10	# 5 (.205)	#50 (.070)	1/16"
1/4"		#48 (.076)	1/16"
5/16"		#48 (.076)	1/16"
3/8"		#36 (.106)	3/32"
7/16"		#36 (.106)	3/32"
1/2"		#36 (.106)	3/32"
9/16"		#28 (.141)	1/8"
5/8"		#28 (.141)	1/8"
		#4 (.209)	3/16"
		#16 (.177)	5/32"
		#1 (.272)	1/4"

