Capt. McRainey an ed

C-47

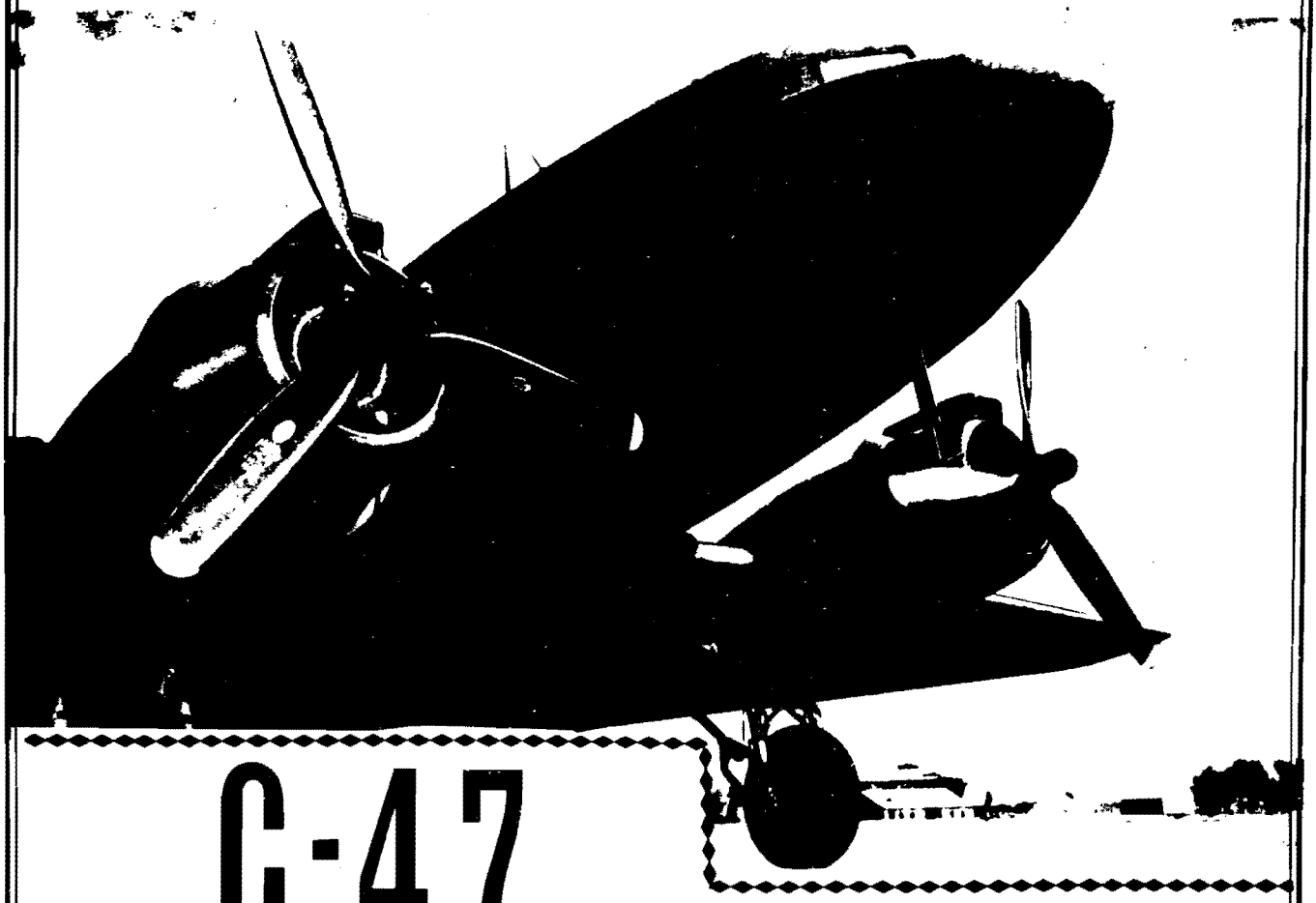
DIRECTED STUDY PROGRAM

501 63 #219/5 515.

{Tel 911632
mr. Stein

OPERATIONS TRAINING

DIRECTED STUDY PROGRAM



C-47

PUBLISHED by FLIGHT OPERATIONS

PUBLICATIONS DEPARTMENT

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

FIGURE INDEX

FIGURE INDEX (Cont'd)

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-1

GENERAL DESCRIPTION

The Douglas C-47 airplane is a two-engine, low wing monoplane with retractable main landing gears. It is powered by two Pratt and Whitney R-1830-92 engines and is equipped with Hamilton Standard Hydromatic Propellers.

Fuselage

The fuselage is of semi-monocoque, all metal, stressed skin construction, incorporating transverse frames, and longitudinal stiffeners, with smooth aluminium alloy sheet covering. There are ice protector strips on the sides of the fuselage in line with the plane of rotation of the propellers. The tail cone assembly is attached to the fuselage stub by means of bolts screwed into nut plates on the fuselage. The tail cone light is a part of the tail cone assembly.

Wing Group

The wing is of full cantilever all-metal construction. It has a center section permanently attached to the fuselage, two removable outer panels bolted to the center section, and two removable wing tips bolted to the outer panels. The engine nacelles are built as integral parts of the center section. The main landing wheels retract into the nacelles. Wing flaps, extending from the inboard ends of the ailerons, beneath the fuselage, are incorporated in the center wing section, aft of the rear spar. The flaps are of all metal construction and operate hydraulically.

Fabric-covered ailerons extend along the trailing edge of each outer panel. They are balanced aerodynamically and statically by weights bolted to the aluminium alloy sheet, which covers the surface forward of the spar. The right aileron has a metal trim tab operated by a control on the pedestal in the pilots' compartment.

Tail Group

The horizontal and vertical stabilizers are of all metal (aluminium alloy) type construction, attached in fixed alignment to the fuselage. The elevators and rudder are of metal frame, fabric covered, construction. They are balanced areodynamically and statically by lead weights attached to the skin. The rudder and each elevator has a trim tab all controllable from the pilots' compartment.

DIRECTED STUDY PROGRAM

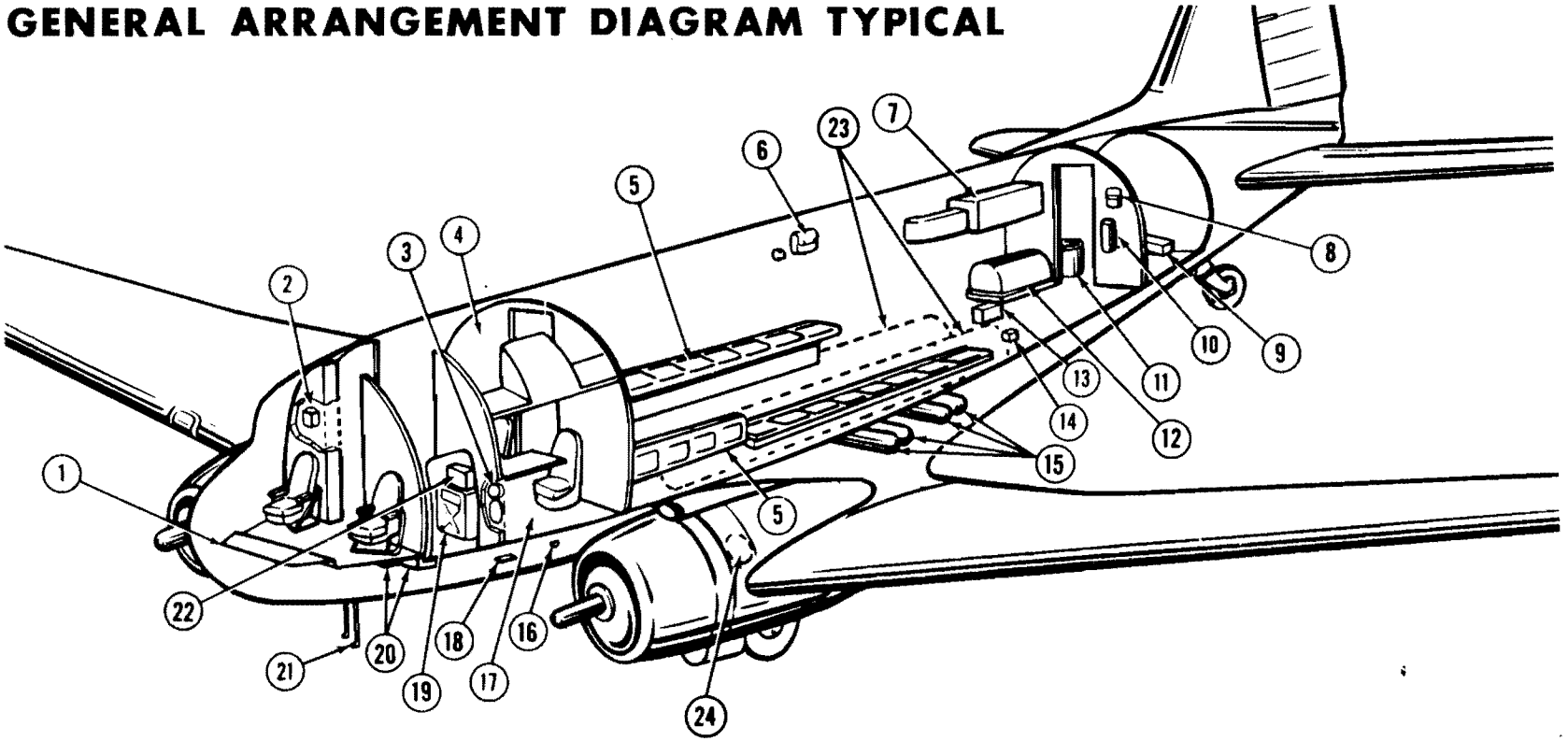
C-47

DATE: 15 April 67

REF: 1080-1

1. The Douglas C-47 is a _____ engine, low wing monoplane with retractable _____ landing gear.	
2. The C-47 is powered by two _____ engines and is equipped with _____ propellers.	two; main
3. The fuselage is of _____ construction, incorporating transverse frames and longitudinal stiffners with smooth aluminium alloy sheet covering.	Pratt and Whitney R-1830-92; Hamilton Standard; hydromatic
4. The wing is of _____ all-metal construction with center section permanently attached to fuselage.	semi-monocoque; all-metal; stressed skin
5. The engine nacelles are built as integral parts of the _____ section.	full cantilever
6. The main landing gear retract into the _____.	center wing
7. Wing flaps, extending from inboard ends of the ailerons, beneath the fuselage are incorporated in the _____ wing section.	nacelles
8. Wing flaps are of _____ construction and operate _____.	center
9. _____ covered ailerons extend along trailing edge of each outer wing panel. The _____ aileron has a metal trim tab.	all-metal; hydraulically
10. The horizontal and vertical stabilizers are of _____ construction. The elevators and rudder are of _____ construction.	Fabric; right
	all-metal (aluminum alloy) type; metal frame fabric covered

GENERAL ARRANGEMENT DIAGRAM TYPICAL



1. PILOTS COMPARTMENT
2. HYDRAULIC PRESSURE ACCUMULATOR
3. PORTABLE OXYGEN CYL.
4. RADIO OPERATORS COMP.
5. FOLDING TROOP SEATS
6. LITTER HANGER
7. SPACE HEATER
8. MISC. STOWAGE
9. ENG. COVER STOWAGE
10. SURFACE CONTROL LOCKS STOWED
11. TOILET
12. A.P.P.
13. PARAPACK CONTROL JUNCTION BOX
14. LOW PRES. SYS. OXY. FILLER VALVE
15. LOW PRES. SYS. OXY. TANKS
16. ALTERNATE STATIC SOURCE
17. NAVIGATORS COMPARTMENT
18. EXTERNAL POWER RECEPTACLE
19. MAIN ELECTRICAL JUNCTION BOX
20. BATTERIES
21. PITOT STATIC TUBE
22. POWER SYSTEMS JUNCTION BOX
23. L.R. FUEL TANKS
24. C.B. CONTAINER

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-1

Flight Compartment

The flight compartment includes stations for the Captain, First Officer, Radio Operator, plus provisions for a jump seat for a check Pilot Observer. The jump seat is located in the aisle behind the Captain and First Officer. The floor contains removable panels for access to controls and various mechanical systems. The flight compartment has left and right windshield assemblies, each of heavy glass panels, corner windows, and sliding side windows. The corner windows may be opened in emergency and the side windows may also be opened during flight.

Cabin

Cabin is equipped for cargo carrying, and has sufficient tie down points for this purpose. The cabin has an anchor cable installed for parachute dropping with static lines. Folding canvas benches are also provided for 28 passengers.

Rudder Pedal Adjustment

Captains' and First Officers' rudder pedals are adjustable. There is a spring latch on the lower outside corner of each rudder pedal. By pushing the latch away from the pedal, you can slide the pedal forward or backward. When you have the pedal where you want it, release the latch and the pedal locks into the nearest notch. Be sure pedals are locked into position and that the pedals are exactly equal when the rudder is in neutral.

Instruments

The engine, flight and other instruments necessary for the operation of the airplane, are mounted on three panels. The main instrument panel is at the front of the flight compartment, below the windsheild. Two upper panels are adjacent to the windsheild on both left and right sides. The main instrument panel is constructed of non-magnetic materials and is mounted on Lord Shock Absorber Units.

No buffet is provided. In the aft end of the passenger compartment a lavatory, consisting of a bucket seat toilet and a wash basin, is installed.

Tail section access door is located in the aft bulkhead of the lavatory and leads to the tail section, which contains the flight control mechanism and tail wheel strut.

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-1

1. The flight compartment includes stations for the _____, _____, _____, plus provisions for a jump seat for a _____.	captain; first officer; radio operator; check pilot observer
2. The cabin is equipped for _____ and _____. The cabin has an _____ installed for parachute dropping with static lines. Folding canvas benches are provided for _____ passengers.	passengers; cargo; anchor cable; 28
3. The engine, flight and other instrument necessary for the operation of the airplane are mounted on _____ panels.	three
4. The main instrument panel is constructed of _____ and is mounted on _____ units.	non-magnetic materials; Lord shock absorber
5. No buffet is provided. A lavatory is installed in the aft end of _____ compartment.	passenger
6. A tail section access door located aft of lavatory provides access to the tail section which contains the _____ and _____.	flight control mechanism; tail wheel strut

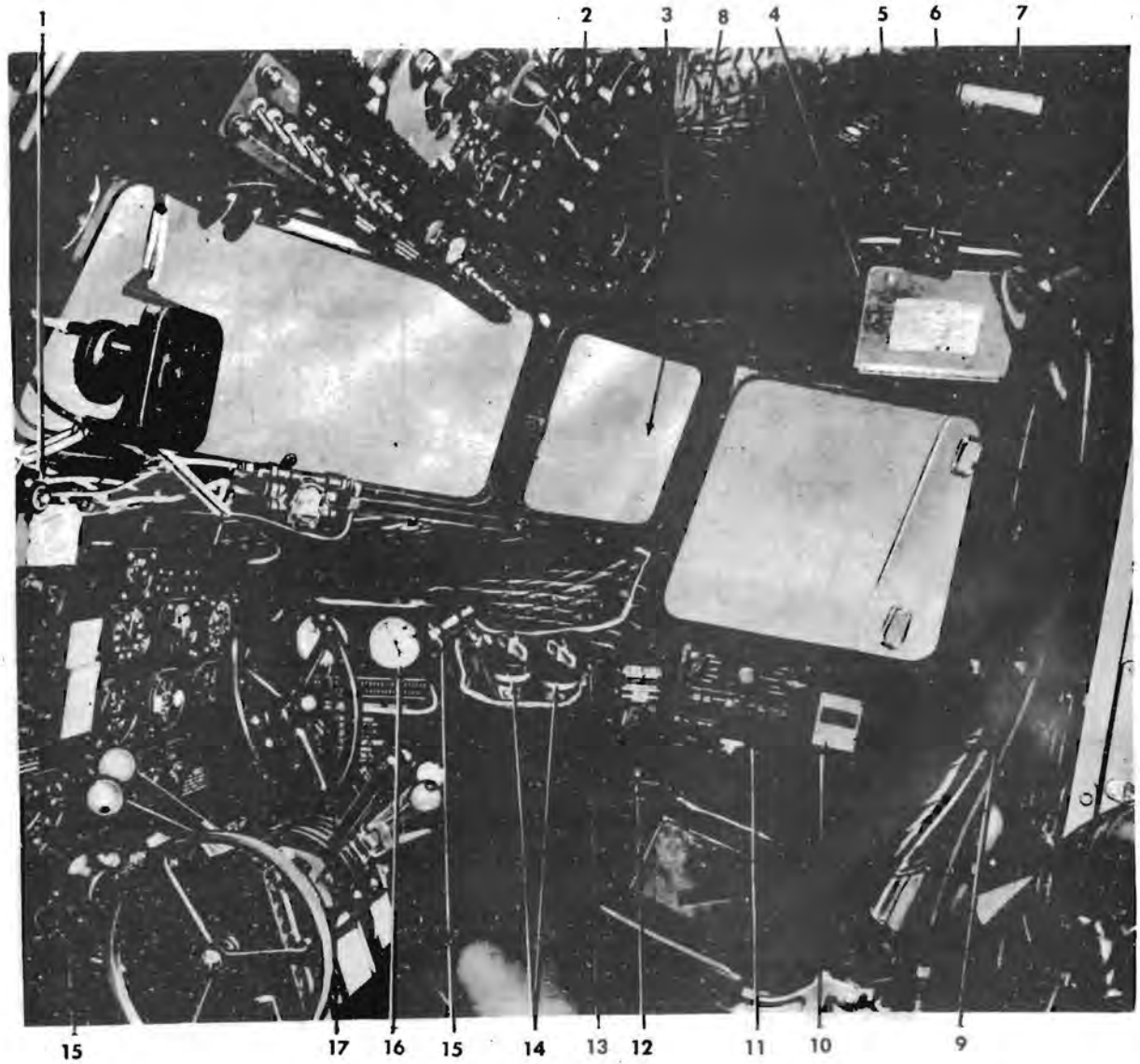
DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

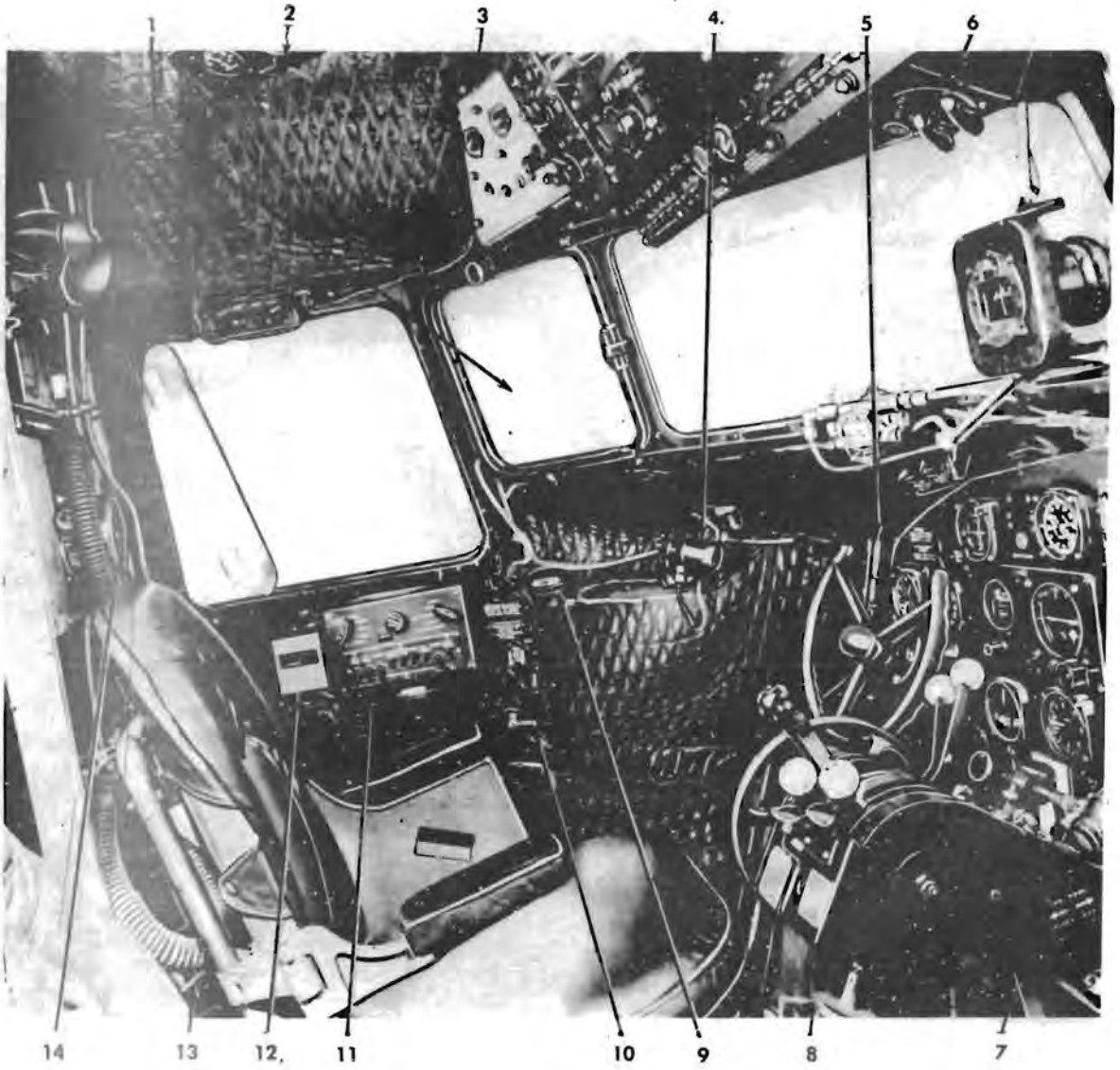
REF: 1080-1

COCKPIT ARRANGEMENT — TYPICAL
RIGHT SIDE



1. WINDSHIELD WIPER CONTROL VALVE
2. PILOT'S RADIO CONTROL PANEL
3. RIGHT ELECTRICAL PANEL
4. SPARE LIGHTS
5. OXYGEN PRESSURE GAGE AND FLOW INDICATOR
6. CARBURETOR DE-ICING CONTROL VALVE HANDLE
7. CO-PILOT'S OVERHEAD FLUORESCENT LIGHT
8. CLEAR VISION WINDOW
9. OXYGEN FLOW REGULATOR
10. RADIO FILTER
11. INTERPHONE CONTROL PANEL
12. WINDSHIELD DE-ICING CONTROL VALVE HANDLE
13. SHIELDED MAP READING LIGHT
14. COWL FLAP HANDLES
15. FLUORESCENT INSTRUMENT LIGHT
16. HYDRAULIC SYSTEM PRESSURE GAGE
17. LANDING GEAR PRESSURE GAGE

COCKPIT ARRANGEMENT—TYPICAL
LEFT SIDE



1. CLEAR VISION WINDOWS
2. OXYGEN PRESSURE GAGE AND FLOW INDICATOR
3. LEFT ELECTRICAL PANEL
4. FLUORESCENT INSTRUMENT PANEL LIGHT
5. WING FLAP POSITION INDICATOR
6. IGNITION SWITCHES
7. TAIL WHEEL LOCK LEVER
8. THROTTLE FRICTION LOCK
9. SHIELDED MAP READING LIGHT
10. WINDSHIELD ALCOHOL DE-ICING VALVE CONTROL HANDLE
11. INTERPHONE CONTROL PANEL
12. RADIO FILTER
13. PROPELLER DE-ICER RHEOSTAT SHUTOFF VALVE AND TANK
14. OXYGEN FLOW REGULATOR

SPECIFICATIONS

Span	95 feet
Length	64 feet, 5½ inches
Height (level)	23 feet, 6 inches
Height (3 point position)	16 feet, 11 inches

Settings & Ranges of Control Surfaces Movements

Ailerons UP travel	13" ± 1/8" (27 degrees)
Ailerons DOWN travel	8" ± 1/2" (18 degrees)
Elevators UP travel	12" ± 1/8" (30 degrees)
Elevators DOWN travel	8" ± 1/8" (20 degrees)
Rudder LEFT travel	26½" ± 1/4" (29½ ± 1 degrees)
Rudder RIGHT travel	26½" ± 1/4" (29½ ± 1 degrees)

Trim Tabs

Elevator tab UP travel	1-5/8" ± 1/8" (12 degrees)
Elevator tab DOWN travel	1-5/8" ± 1/8" (12 degrees)
Rudder tab LEFT travel (rudder neutral)	2-3/4" ± 1/8" (12 degrees)
Rudder tab RIGHT travel (rudder neutral)	2-3/4" ± 1/8" (12 degrees)
Aileron tab UP travel	2" ± 1/8" (12½ degrees)
Aileron tab DOWN travel	2" ± 1/8" (12½ degrees)

Main Landing Gear

Type: Two individual, hydraulically retractable dual shock strut, single wheel units.

Tread: 18' 6" (wheels center to center)

Shock strut: Cleveland oleo-pneumatic (combination air and liquid) (2½" - 4" Extension)

Tires: 17:00 x 16, ten ply rating. Inflation specs. 48 + 2 - 0 lbs.

Wheels: Goodyear 17:00 x 16, magnesium

Brakes: Bendix Hydraulic Shoe & Drum Type

Tail Wheel

Type: Single wheel hinged with a single strut

Size: 9:00 x 6, inflation 50 + 2 - 0

Manufacturer: Douglas Aircraft Company

Power Plant

Type: Prat & Whitney, R-1830-92.

Dry Weight:
(less accessories) Approximately 1450 pounds

Bore: 5.5 inches

Stroke: 5.5 inches

Displacement: 1830 cubic inches

Compression ratio: 6.70 : 1

Impeller Gear ratio: 7.15 : 1

Propeller Shaft Spline Size: SEA 50

Propeller reduction gear ratio: .5625 : 1 (9:16)

Propellers

Type: Hamilton Standard, 23 E50-473, hydromatic 3-blades

Hub: 23E50

Blades: 4677A - 0 (wide blades)

Diameter: 11 feet, 7 inches

Pitch Setting:
Low - 16 degrees (maximum range)
High - 88 degrees (maximum feather range)
Low - 16 degrees (governing range)
High - 45 degrees (governing range)

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-1

1. Dimensions of the C-47 are: Span _____ Length _____ Height (level) _____ Height (3 point position) _____	
2. The tread of the main landing gear is _____. The tire size is _____ with _____ ply rating with inflation of _____.	95 feet 64 feet, 5½ inches 23 feet, 6 inches 16 feet, 11 inches
3. The main gear shock strut is _____. Extension range is _____ to _____. Brakes are _____ type.	18 feet 6 inches (wheels center to center); 17:00 x 16; ten; 48 (+2-0) lbs.
4. The tail wheel is _____. The tire size is _____. Inflation is _____.	Cleveland Oleo-Pneumatic; 2¼ inches - 4 inches; Bendix hydraulic shoe and drum
5. The power plant for the C-47 is _____. The dry weight (less accessories) is _____. The bore is _____ and stroke is _____. Displacement of this engine is _____, with a compression ratio of _____, and an impeller gear ratio of _____. Propeller reduction gear ratio is _____.	single wheel hinged with a single strut; 9:00 x 6 ; 50 (+2-0) lbs.
6. Propellers are _____. The diameter of the propeller is _____. Pitch settings are: Low _____ maximum range High _____ maximum feather range Low _____ governing range High _____ governing range	Pratt and Whitney R-1830-92; approx. 1450 lbs.; 5.5 inches; 5.5 inches; 1830 cubic inches; 6.70:1; 7.15:1; .5625:1 (9:16)
	Hamilton Standard 23 E50-473/hydromatic 3-blades; 11 feet 7 inches; 16 degrees; 88 degrees; 16 degrees; 45 degrees

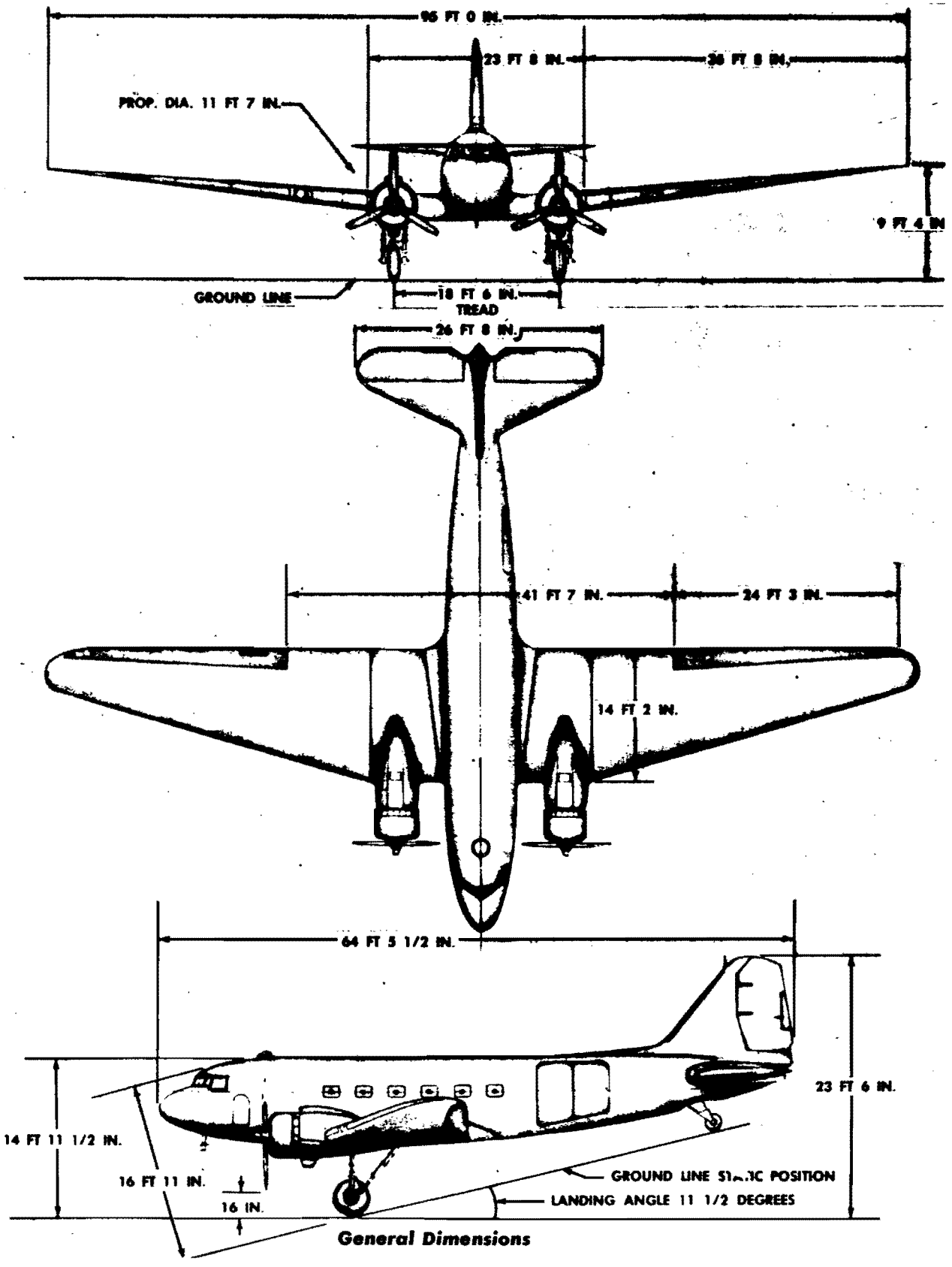
DIRECTED STUDY PROGRAM

C-47

PAGE: 8a

DATE: 15 April 67

REF: 1080-1

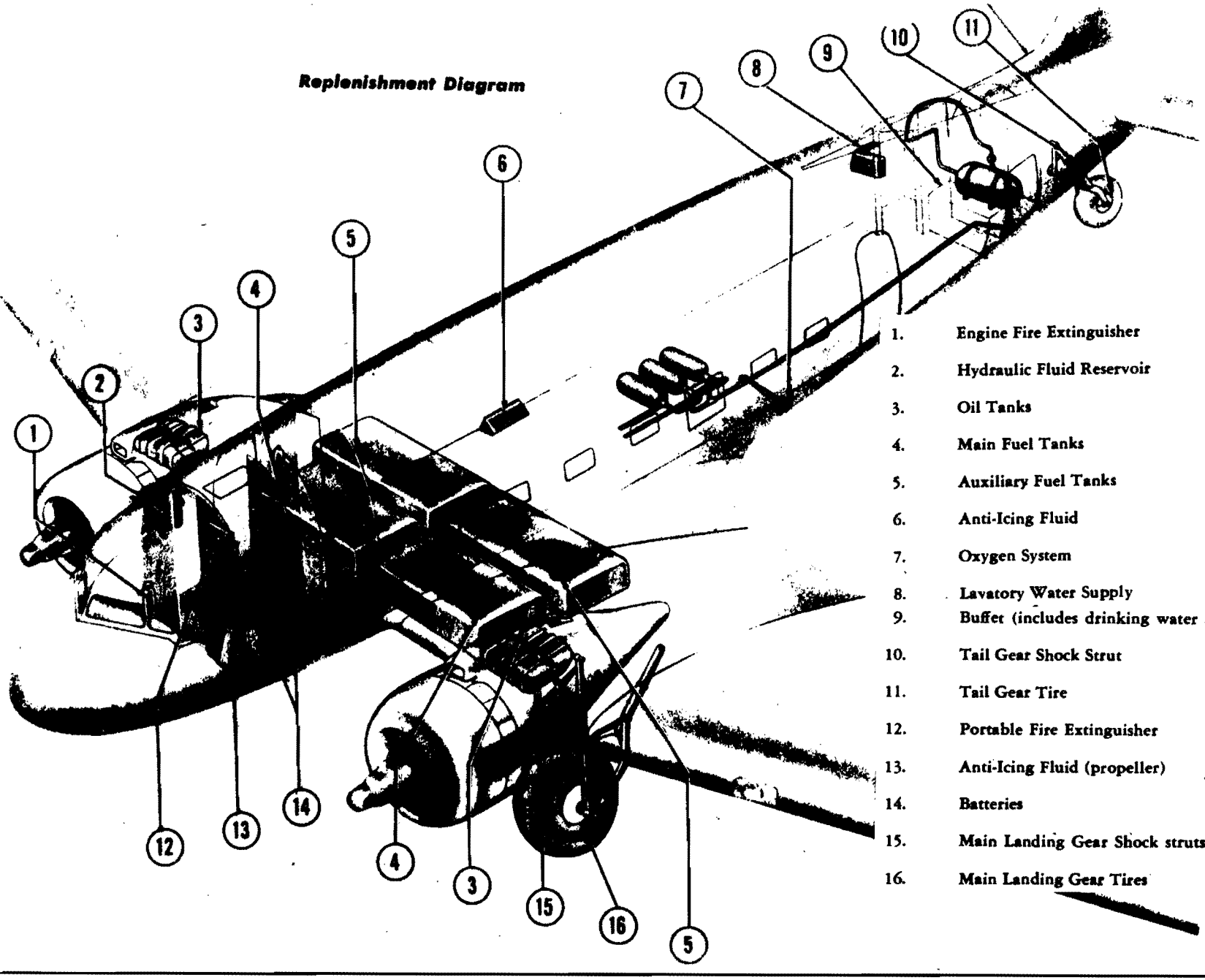


General Dimensions

DIRECTED STUDY PROGRAM

C-47

Replenishment Diagram



1. Engine Fire Extinguisher
2. Hydraulic Fluid Reservoir
3. Oil Tanks
4. Main Fuel Tanks
5. Auxiliary Fuel Tanks
6. Anti-Icing Fluid
7. Oxygen System
8. Lavatory Water Supply
9. Buffet (includes drinking water supply)
10. Tail Gear Shock Strut
11. Tail Gear Tire
12. Portable Fire Extinguisher
13. Anti-Icing Fluid (propeller)
14. Batteries
15. Main Landing Gear Shock struts
16. Main Landing Gear Tires

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

This section contains stall, take-off, climb, and landing performance. The performance information is from the current U.S. Military Flight Manual. The data represents safe aircraft operation but is not FAA approved.

Stall, take-off, climb, and landing speeds are presented in indicated airspeed (IAS). This is the speed that appears on the Captain's indicator. In order to achieve the performance specified, it is necessary to fly these speeds.

Stall

Stall speeds are shown for varying weights, angle of bank and flap configuration.

Take-Off

Normal take-off (zero flap) and short field take-off (½ flap) distances are given for varying temperatures, altitudes, gross weights and wind.

These distances are representative of hard surface runways. When other than hard surface runways are used, the ground roll distance must be increased. The factor by which the ground roll must be increased is dependent on the pilot's evaluation of the take-off surface and his previous experience. As a general rule, sod runways will increase ground roll distance by 25% over hard surface and soft runways where the tires will sink in one or more inches will increase ground roll a minimum of 35%.

Climb

Two engine and single engine climb performance is presented for various climb power settings and gross weights. The rate of climb given for a specified weight and power setting will only be attained at best rate of climb speed. Climb power settings are given on page 10 together with cruise power settings.

Landings

Landing performance is presented for varying conditions of temperature, field elevation, gross weight and wind.

PERFORMANCE AND LIMITATIONS

APPROXIMATE STALLING SPEEDS - POWER OFF

NOTE: 1. Airspeed below is IAS in knots

2. The extended landing gear has no appreciable effect on the stalling characteristics.

	0 FLAP			1/4 FLAPS		
Gross Weight	Level	30° Bank	45° Bank	Level	30° Bank	45° Bank
(LBS)	(Knots)	(Knots)	(Knots)	(Knots)	(Knots)	(Knots)
28,000	70	75	84	66	71	79
27,000	68	73	82	64	69	77
25,000	65	70	78	62	66	74
23,000	62	67	75	59	63	71
21,000	59	64	71	56	60	68
	1/2 FLAPS			FULL FLAPS		
Gross Weight	Level	30° Bank	45° Bank	Level	30° Bank	45° Bank
(LBS)	(Knots)	(Knots)	(Knots)	(Knots)	(Knots)	(Knots)
28,000	62	67	74	60	65	72
27,000	61	65	72	59	63	70
25,000	58	62	69	56	60	68
23,000	55	60	66	53	58	64
21,000	53	57	63	51	55	61

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

PERFORMANCE AND LIMITATIONS

1. Stall, take-off, climb and landing speeds are presented in _____ air speed. This is the speed that appears on the _____ indicator.

2. Approximate stalling speeds, power off, 28,000 lbs. gross weight with zero (0) flap are:
   Level _____ knots
   30° bank _____ knots
   45° bank _____ knots

   indicated; captain's

3. Approximate stalling speeds, pwoer off, 28,000 lbs. gross weight with 1/4 flap are:
   Level _____ knots
   30° bank _____ knots
   45° bank _____ knots

   70; 75; 84

4. Approximate stalling speeds, power off, 28,000 lbs. gross weight with 1/2 flaps are:
   Level _____ knots
   30° bank _____ knots
   45° bank _____ knots

   66 71 79

5. Approximate stalling speeds, power off, 28,000 lbs. gross weight with full (45°) flap are:
   Level _____ Knots
   30° bank _____ knots
   45° bank _____ knots

   62 67 74

6. Normal take-off is with _____ flap, and short field take-off is with _____ flap.

   60; 65; 72

7. Take-off distances are computed and representative of _____ surface runways. SOD runways will increase ground roll distance by _____% on soft runways where tires will sink in one or more inches will increase ground roll a minimum of _____%.

   zero (0); 1/4

8. The best rate of climb given for a specified weight and power setting will only be attained at best _____ of climb speed.

   hard; 25; 35

9. Landing performance is presented for varying condition of _____, _____, _____, and _____.	rate temperature; field elevation; gross weight; wind

GENERAL

Fuel	Grade 100/130 octane
Oil Grade	Grade 1100 MIL-L-6082
Datum	Nose station 0
Mean Aerodynamic chord	138.1"
Leading edge of MAC	224.4" aft of Datum
Leveling means	Leveling lugs located on left side of airplane forward of cabin door

WEIGHT SPECIFICATIONS

Maximum Take-off	28,000 lbs.
Maximum Landing	26,000 lbs.

CENTER OF GRAVITY

The aircraft must be loaded in accordance with approved charts and data.

a. The maximum forward center of gravity position is 11% of the mean aerodynamic chord.

b. The maximum rearward center of gravity position for operation is 28% of the mean aerodynamic chord.

c. 18% - 24% desired C.G.

TYPE OF OPERATION

The airplane is limited to operate under no icing conditions.

DIRECTED STUDY PROGRAM

C-47

PAGE: 6

DATE: 15 April 67

REF: 1080-2

1. Fuel grade is _____ octane, which is a _____ color.	
2. Oil grace is _____.	100/130; green
3. The datum line of the C-47 is the _____.	1100 (50 SAE) MIL-L-6082
4. The MAC is _____ inches, and the leading edge of MAC is _____ inches aft of datum.	nose; station 0
5. Maximum take-off weight is _____ lbs., and maximum landing weight is _____ lbs.	138.1" 224.4"
6. The maximum forward CG position is _____% of the MAC, and the rearward CG position for operation is _____ % of the MAC.	28,000 lbs. 26,000 lbs
7. The desired CG range is _____ to _____ MAC.	11; 28
8. Company C-47's are limited to operate under _____ icing conditions.	18 to 24%
	no

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

LIMITING AIR SPEEDS

NOTE: All airspeed references, unless otherwise noted, are indicated airspeed (Air speed observed on Captain's indicator).

		Up to and including 24,800 pounds	Between 24,800 and 25,200 pounds	Between 25,200 and 26,900 pounds	Between 26,900 and 28,000 pounds
a.	Level flight or climb	189 knots	184 knots	177 knots	169 knots
b.	Glide or dive	228 knots	224 knots	221 knots	202 knots

c.	Flaps extended	
	1/4 flap	104 knots
	1/2 flap	100 knots
	Full flap	97 knots
d.	Do not extend landing gear in excess of	140 knots
e.	Maximum climb (one engine)	85 knots
f.	Maximum angle climb (one engine)	95 knots
g.	Normal climb (two engines)	105-115 knots
h.	Rough-air speed	120-130 knots
i.	Across-the-boundary speed	120% VSO

1. All air speed references in the C-47 Aircraft Flight Manual, unless otherwise noted, are _____ air speeds observed on _____ indicator.	
2. Limiting air speed level flight or climb (between 26, 900 and 28,000 pounds) is _____ knots.	indicated; captain's
3. Limiting air speed for glide or dive (between 26, 900 and 28,000 pounds) is _____ knots.	170 knots
4. Limiting air speeds for extending flaps are: 1/4 flap _____ knots 1/2 flap _____ knots 3/4 to full flap _____ knots	202 knots

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

5. Do not extend landing gear in excess of _____ knots.	Company / USAF 135 knots / 104 knots 99 knots / 100 knots 97 knots / 97 knots
6. Speed for maximum angle of climb (one engine) is _____ knots.	139 knots
7. Speed for normal climb (one engine) is _____ knots.	85 knots
8. Speed for normal climb (two engines) is _____ to _____ knots.	85 knots
9. Rough-air speed is _____ to _____ knots.	105 to 115 knots
10. Across-the-boundary speed is _____% VSO normal operation, or _____% VSO for short field operation.	120 to 130 knots
	120% 110%

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

INSTRUMENT LIMIT MARKINGS

Green ARC	Normal Operating Range
Red Radical Line	Maximum or Minimum Limits
Yellow ARC	Cautionary Range
White ARC	Index mark on flap operating range and airspeed approach limits

1. Instrument limit markings are: Normal operating range _____ ARC Maximum or minimum limits _____ line Cautionary range _____ ARC Index mark on flap operating range and airspeed approach limits _____ ARC	
	Green; red radial; yellow; white

ENGINE OPERATION LIMITS C-47

The operation limitations herein represent a consolidation of the minimum requirements set forth in applicable flight operation instruction handbooks for safe operation of the airplane, and the optimum performance values of airplane component systems specified in applicable maintenance manuals or service and overhaul handbooks. The primary objective is to provide desired standards of performance for maintenance evaluation and action. It is to be realized that optimum or desired values may not be attainable under all conditions, but that such values should be adhered to whenever possible to enhance consistent trouble-free operation by reducing the chances of approaching marginal conditions. Flight operation limitations and based on overall performance within safe limits. Therefore, the normal flight operating ranges and limits necessary for safe conduct of a flight will be designated by a letter "F".

ENGINE POWER SETTINGS C-47

The C-47 is equipped with R-1830-92 engines (equivalent to the commercial S103-G engine) and Stromberg PD12H4-1 carburetors. The following power settings are those presently authorized for normal operation:

1. The C-47 is equipped with _____ engines (equivalent to the commercial _____ engine) and _____ carburetors.	
	P & W R-1830-92; S103-G; Stromberg PD124H-1

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

TYPE OF POWER	BHP	RPM	MIXTURE	APPROXIMATE FUEL FLOW PER ENGINE GPH	LBS/HOUR
Take-off (1 Min.)	1,200	2,700	AR	155	920
METO	1,050	2,550	AR	127	755
Climb	850	2,350	AR	54	322
Standard Cruise	550	2,050	AL	41.5	247
High Speed Cruise	620	2,050	AL	46	274

Charts are available for the power settings listed above. Manifold pressures used vary with altitude and carburetor air temperature. Allowable fuel flow tolerance is plus or minus 10%.

Manifold Pressures

Take-off (1 Minute)

BHP	RPM	MP	PRESSURE ALTITUDE
1,200	2,700	48	Sea Level

Maximum continuous (normal rated power)

1,050	2,550	41.5	Sea Level
1,050	2,550	39.5	7500 feet

Ground power check at 2450 rpm — Field bar. ± 1 in. Hg.

Ignition check in flight — Cruise seeting (A.R.)

1. Take-off power is limited to _____ min., developing _____ BHP, at _____ RPM, mixture _____, and approximate fuel flow per engine is _____ GPH or _____ lbs/hour.	
2. METO power develops _____ BHP, at _____ RPM, mixture _____, and approximate fuel flow per engine is GPH or _____ lbs/hour.	1; 1200 BHP; 2700 RPM; AUTO RICH; 155 GPH; 920 lbs/hour
3. Climb power develops _____ BHP, at _____ RPM, mixture _____, and approximate fuel flow per engine is _____ GPH or _____ lbs/hour.	1050 BHP; ~~2550~~ 2350 RPM; AUTO RICH; 127 GPH; 755 lbs/hour
4. Standard cruise power develops _____ BHP, at _____ RPM, mixture _____, and approximate fuel flow per engine is _____ GPH or _____ lbs/hour.	720 BHP; 2300 RPM; AUTO RICH; 54 GPH; 322 lbs/hour

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

5. High speed cruise develops _____ BHP, at _____ RPM, mixture and approximate fuel flow per engine is _____ GPH or _____ lbs/hour.	550 BHP; 2050 RPM; AUTO LEAN; 41.5 GPH; 247 lbs/hour
6. Manifold pressure used for power settings above will vary with _____ and _____.	620 BHP; 2050 RPM; AUTO LEAN; 46 GPH; 274 lbs/hour
7. Allowable fuel flow tolerance is plus or minus _____%.	altitude; carburetor air temperature
8. Manifold pressure for take-off (1 minute) at standard sea level is _____ Hg.	10%
9. Manifold pressure for maximum continuous (normal rated power) at sea level is _____ Hg, at 7500 feet _____ Hg.	48"
10. Manifold pressure for ground power check at _____ RPM is _____.	41.5" · 39.5"
11. Ignition check in flight (at cruise settings) should be performed with mixture in _____ position.	2450 RPM; field barometric pressure ± 1"
	AUTO RICH

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

RPM

a. Take-off..... 2700 ± 50 rpm
b. High pitch..... 1200 ± 50 rpm
c. Ground power check..... 2450 rpm ± 50
d. Ignition check..... 2450 rpm ± 55
e. Ignition check rpm drop..... 65 rpm max 40 rpm spread (from both mags to single)
f. Idling..... 500 ± 50 rpm
g. Idle mixture check..... 10 - 20 rpm mom. inc. or approx. ¼" M.P. dec.

RPM restricted ranges are as follows:

1300 - 1,700 rpm..... Empennage vibration
2,100- 2,300 rpm..... Reduce crankshaft stresses and consequent rejection at overhaul

ENGINE OVERSPEEDING

The following speeds have been established as the maximum overspeed limits beyond which it is considered advisable to disassemble and inspect the engine.

ENGINE	RPM
R-1830	2900 - 3050 insp. 3050 + engine change

1. On take-off the propellers should develop _____ RPM.	
2. Propeller high pitch (full decrease) is _____ RPM.	2700 ± 50 RPM
3. Ground power check should be made at _____ RPM.	1200 ± 50 RPM
4. Ignition check should be made at _____ RPM.	2450 RPM
5. On ignition check the maximum RPM drop is _____ RPM, with a spread between R & L mag of _____ RPM.	2450 RPM
6. Idling speed is _____ RPM. 65	65; 40
7. Idle mixture check should indicate a _____ to _____ RPM momentary increase or approximately _____" MAP decrease.	500 ± 50 RPM

8. RPM restricted ranges are: To minimize vibration, below _____ RPM and to reduce crankshaft stresses and consequent rejection at overhaul _____ to _____ RPM.	10 to 20 RPM 1/4"
9. The maximum overspeed limit of the R-1830 engine is _____ RPM. - Co A/C	1700 RPM 2100 - 2300 RPM
	3050 RPM

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

Fuel Pressure

a.	Desired cruise	17 psi
b.	Normal operating	16 - 18 psi
c.	Minimum for flight	16 psi
d.	Maximum for flight	20 psi
e.	Idling minimum	9 psi
f.	Normal operating-booster (no flow)	17 - 18 psi

Oil Pressure

NOTE: When checking oil pressure on ground propeller control should be in low pitch.

a.	Desired at 2000 rpm at 60°C	85 ± 5 psi
b.	Normal operating	65 - 95 psi
c.	Minimum for flight	60 psi
d.	Maximum allowable	110 psi
e.	Minimum at 2550 rpm at 100°C	80 psi
f.	Minimum at 2250 rpm at 85°C	65 psi
g.	Minimum at 1200 rpm at 85°C	45 psi
h.	Minimum idle	15 psi

1. Desired cruise fuel pressure is _____ psi. Co. A/C	
2. Normal operating fuel pressure is _____ to _____ psi.	17 psi
3. Minimum for flight fuel pressure is _____ psi. Co A/C	16 to 18 psi (Co. A/C) 14 to 16 psi (USAF)
4. Maximum for flight fuel pressure is _____ psi. Co A/C	16 psi
5. Minimum fuel pressure for idling is _____ psi. all A/C	20 psi
6. Normal operating - booster (no flow) fuel pressure is _____ to _____ psi. Co A/C	9 psi
7. When checking oil pressure on the ground, the propeller control should be in _____ pitch (_____ RPM position).	17 to 18 psi

8. Desired oil pressure at 2000 RPM with oil temperature at 60°C is _____ psi.	low full increase
9. Normal operating oil pressure range is _____ to _____ psi.	85 ± 5
10. Minimum for flight oil pressure is _____ psi.	65 ± 95
11. Maximum allowable oil pressure is _____ psi.	60 psi
12. Minimum oil pressure at 2550 RPM at 100°C is _____ psi.	100 psi
13. Minimum oil pressure at 2250 RPM at 85°C is _____ psi.	80 psi
14. Minimum oil pressure at 1200 RPM at 85°C is _____ psi.	65 psi
15. Minimum oil pressure for idle is _____ psi.	45 psi
	15 psi

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

MAXIMUM ALLOWABLE OIL CONSUMPTION

At main base : 1.5 GPH - Engine changed beyond this figure.

At airline stations : a. 1.5 - 1.8 GPH - Aircraft temporarily grounded. Station Chief Mechanic seeks instruction from main base.

b. 1.8 GPH - Aircraft grounded for engine change or ferry pending instruction from main base.

Oil Temperatures

a.	Desired cruise	60° - 75°C
b.	Normal operating	60° - 80°C
c.	Maximum allowable cruise	85°C
d.	Maximum allowable	100°C
e.	Minimum for take-off and flight	40°C

1. Maximum allowable oil consumption (at main base) is _____ GPH. Engine change beyond this figure.	
2. Maximum allowable oil consumption (at airline stations) is: from _____ to _____ GPH, and aircraft is temporarily grounded, Station chief mechanic seeks instruction from main base, at _____ GPH and aircraft grounded for engine change or ferry.	1.5 GPH
3. Desired oil temperature for cruise is _____ to _____°C.	1.5 to 1.8 GPH 1.8 GPH
4. Normal operating oil temperature is _____ to _____°C.	60° to 75°C
5. Maximum allowable cruise oil temperature is _____°C.	60° - 80°C
6. Maximum allowable oil temperature is _____°C.	85°C
7. Minimum oil temperature for take-off and flight is _____°C.	100°C
	40°C

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

Cylinder Head Temperatures

Desired continuous	180° - 205°C
Normal operating	150° - 232°C
Maximum take-off and normal rated power	260°C
Maximum continuous operation	232°C
Maximum for ground operation	232°C
Maximum before engine shutdown	200°C
Minimum for magneto check	150°C

Carburetor Air Temperature

Normal operating range	+15° to +40°C
Maximum allowable	+50°C
Icing range	-10° to +15°C

NOTE: Engine operation limits based on R-1830-92 engine using Hamilton Standard 23E50-473-6477A-0 propeller and minimum fuel grade 100/130.

1. Desired continuous cylinder head temperature is _____ to _____°C.	
2. Normal operating cylinder head temperature is _____ to _____°C.	180° to 205°C
3. Maximum cylinder head temperature for take-off and normal rated power is _____°C.	150° to 232°C
4. Maximum cylinder head temperature for continuous operation is _____°C.	260°C
5. Maximum cylinder head temperature for ground operation is _____°C.	232°C.
6. Maximum cylinder head temperature before engine shutdown is _____°C.	232°C
7. Minimum cylinder head temperature for magneto check is _____°C.	200°C
8. Normal operating range for carburetor air temperature is _____°C.	150°C

9. Maximum allowable carburetor air temperature is _____°C.	+15° to +40°C
10. Icing range (carburetor) is _____ to _____°C.	+50°C
	-10° to 15°C

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

Main Hydraulic System

Normal operating	800 - 1000 psi
Maximum operating	1050 psi
Time between cycles - no units operating	over 2 minutes
Desired operating minimum	90 seconds

Autopilot Hydraulic System

Normal operating	110 - 130 psi
Minimum flight	105 psi
Maximum flight	140 psi

Accumulator Air Pressure

Desired	300 ± 20 psi
Minimum	250psi

1. Normal operating pressure of the main hydraulic system is _____ to _____ psi. C-47 A/C	
2. Maximum operating pressure of the main hydraulic system is _____ psi. C-47 A/C	800 to 1000 psi
3. Time between cycles (no units operating) is _____ minutes.	1050 psi
4. Time between cycles (desired operating minimum) is _____ seconds.	over 2 minutes
5. Normal operating pressure of the auto pilot system is _____ to _____ psi.	90 seconds
6. Minimum (flight) pressure for auto pilot hydraulic system is _____ psi.	110 to 130 psi
7. Maximum (flight) pressure for auto pilot hydraulic system is _____ psi.	105 psi
8. Desired accumulator air pressure is _____ psi. C-47 A/C	140 psi

9. Minimum accumulator air precharge is _____ psi.	300 ± 20 psi
	250 psi

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

Main Wheel Tire Pressure

Inflate to	55 psi
Normal operating	52 - 58 psi

Tail Wheel Tire Pressure

Inflate to	50 psi
Normal operating	47 - 53 psi

Landing Gear Warning Horn 15 - 18 in. Hg.

Instrument Vacuum - autopilot gage

Desired	4 ± .25 in. Hg.
Minimum	3.5 in. Hg.
Maximum	4.5 in. Hg.

1. Inflate main wheel tire pressure to _____ psi.	
2. Normal operating main wheel tire pressure is _____ to _____ psi.	55 psi
3. Inflate tail wheel tire pressure to _____ psi.	52 to 58 psi
4. Normal operating tail wheel tire pressure is _____ to _____ psi.	50 psi
5. The landing gear warning horn (KLAXON) sounds between _____ to _____ in. Hg. manifold pressure.	47 to 53 psi
6. Desired instrument vacuum - auto pilot gage is _____ inches Hg.	15 to 18"
7. Minimum instrument vacuum - auto pilot gage is _____ inches Hg.	4 ± .25"
8. Maximum instrument vacuum - auto pilot gage is _____ inches Hg.	3.5"
	4.5"

DIRECTED STUDY PROGRAM

C-47

DATE: 15 April 67

REF: 1080-2

Turn and bank indicator suction (not gaged)	1.8 - 2 in. Hg.
Directional gyro precession	4° in 15 minutes
Rate-of-climb	0 (level)
Airspeed - difference between two indicators:	4 knots
Altimeters - at sea level	$\pm$ 50 feet
Tachometer oscilla tion	20 rpm
Electrical system	
a. Generator voltage	$28 \begin{smallmatrix} + .1 \\ - .5 \end{smallmatrix}$ volts
b. Generator cut-in	26 - 27 volts
c. Generator cut-out	Mon. discharge 20 amps

1. Turn and bank indicator vacuum (not caged) _____ to ____ inches Hg.	
2. Directional gyro precession maximum is _____$^{\circ}$ in minutes.	1.8 to 2"
3. Rate-of-climb (static on ground) should indicate _____.	4° in 15 minutes
4. Airspeed difference between two indicators should not be more than _____ knots.	0 (level)
5. Altimeter at sea level should indicate within _____ feet.	4 knots
6. Tachometer oscillation should not be more than _____ RPM.	$\pm$ 50 feet
7. Generator voltage of the electrical system is _____	20 RPM
8. Generatcr cut-in is at ____ to ____ volts	$28 \begin{smallmatrix} + .1 \\ - .5 \end{smallmatrix}$ volts
9. Generator cut-out is at ____-amps.	26 to 27 volts
	momentary discharge 20 amps