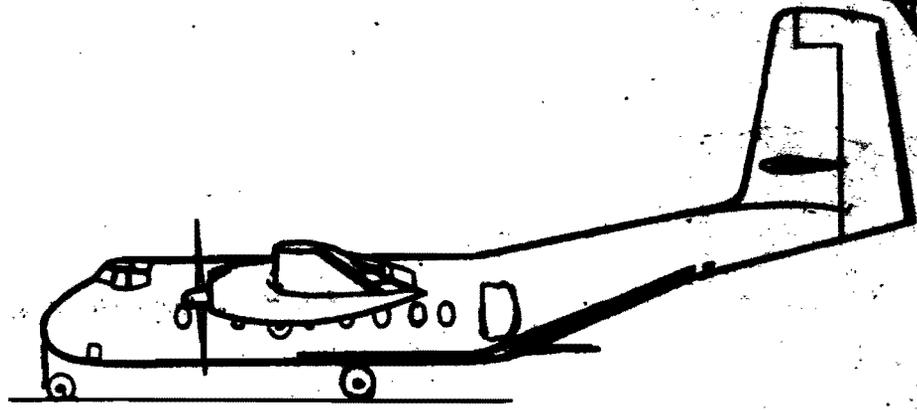


CAPT H.K. LARSON SALMON

DIRECTED STUDY PROGRAM

CARIBOU
DHC-4



FLIGHT OPERATIONS
TRAINING DIVISION

Date: 1 March 1968

DIRECTED STUDY PROGRAM

Page: 1

DHC - 4

Ref.: CONTENTS

TABLE OF CONTENTS

COPY 58

<u>Ref. No.</u>	<u>Subject</u>
1080-1	GENERAL DESCRIPTION
1080-2	PERFORMANCE AND LIMITATION (DISREGARD)
1080-3	POWERPLANTS AND PROPELLERS
1080-4a	FUEL SYSTEM
1080-4b	OIL SYSTEM
1080-4c	HYDRAULIC SYSTEM
1080-4f	HEATING AND VENTILATING
1080-4j	RADIO AND RADAR
1080-4k	ELECTRICAL SYSTEM
1080-4m	IGNITION SYSTEM
1080-4n	AIR INDUCTION SYSTEM
1080-4o	DE-ICING AND ANTI-ICING
1080-4p	INSTRUMENTS
1080-4q	FLIGHT CONTROLS
1080-4t	THRUST INDICATING SYSTEM AND AUTO-FEATHER
1080-4u	SHORT-FIELD APPROACH SYSTEM
1080-5	OXYGEN SYSTEM
1080-6	EMERGENCY EQUIPMENT
1080-7	EMERGENCY SYSTEM AND PROCEDURES

DIRECTED STUDY PROGRAM

Page: 1

DHC - 4

Ref.: 1080-1

GENERAL DESCRIPTION

The DHC-4 Caribou, manufactured by the De Havilland Aircraft of Canada Limited, is an all metal, high wing monoplane, powered by two Pratt and Whitney Twin Wasp engines driving Hamilton Standard, fully feathering, constant speed, reversible propellers. It is designed for passenger or general cargo carrying, for ambulance and rescue work, and for aerial supply dropping. Wide, power operated cargo and ramp doors and an upswept rear fuselage permit direct cargo loading either up the ramp or at truck-bed level. The retractable tricycle landing gear has a steerable nosewheel.

The body is of aluminum alloy, semimonocoque construction. It comprises three permanently attached sections: the front fuselage, the center fuselage and the rear fuselage.

The front fuselage comprises a split level, two seat flight compartment, a cone shaped nose section, and a well for the nose landing gear. The flight compartment has a sliding door entrance from the cabin, a jettisonable in-flight emergency exit hatch in the floor, and a roof hatch.

The center fuselage is designed to accommodate either passengers or cargo. Left and right doors at the aft end of the cabin serve as access for passengers and as emergency exits.

An additional emergency exit is provided by a jettisonable door on the left side of the cabin.

The floor is of aluminum alloy honeycomb construction capable of supporting a load of 1000 lbs./sq.ft.

Sockets are provided in floor channels along the keels at $2\frac{1}{2}$ inch intervals for the insertion of studs which provide the attachments for seats, litters, or cargo tie-down fitting along the left and right walls.

Utility seats can be installed to accommodate up to 32 passengers or 20 NATO litters, and may be folded for stowage against the cabin walls.

Long range fuel and oil tanks can be installed in the cabin for ferrying purposes.

The rear fuselage tapers towards the empennage and is upswept to provide tail clearance for truck loading.

A jettisonable cargo door and a short ramp hinged to the aft end of the rear fuselage are both power operated from the electrical actuators, but may also be handcranked.

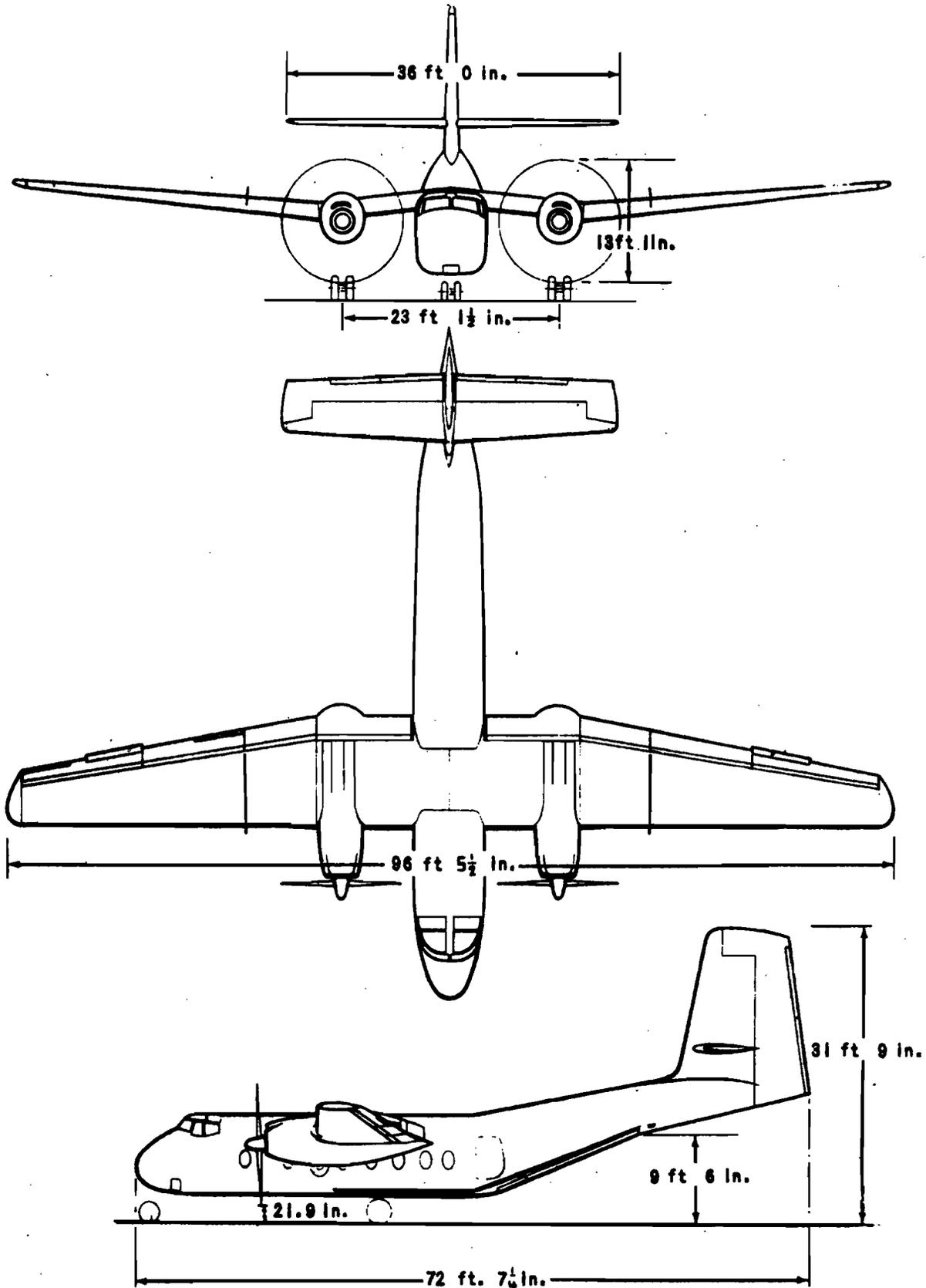
When closed, the cargo door and ramp form part of the rear fuselage belly. A folding, upholstered, draftproof door, fitted to the rear fuselage separates the cabin area from the rear fuselage; the door automatically folds up when the cargo door is jettisoned.

DIRECTED STUDY PROGRAM

Pages 2

DHC - 4

Ref.: 1080-1



Three Dimensional View of Aircraft

DIRECTED STUDY PROGRAM

DHC - 4

Page: 3

Ref.: 1080-1

1. The Caribou is a twin engine aircraft manufactured by _____.	
2. The DHC-4A is powered by _____ engines, which are 14 cylinder radial type.	De Havilland Aircraft of Canada limited
3. The fuselage is of _____ alloy, _____ construction.	PW R-2000-7M2
4. The floor is _____ construction, and the design maximum loading is _____.	aluminum; semi-monoplane
5. The _____ and _____ doors are power operated.	honey-comb; 1000 lbs./sq.ft.
6. The landing gear is _____ and utilizes a _____ nose gear.	ramp; cargo
7. The aircraft has a maximum design capacity for _____ troops, or _____ NATO type litters.	retractable; steerable
	32; 20

DOORS AND EXITS

The aircraft is provided with entrance and exits for both normal and emergency conditions.

These exits include a floor hatch and a roof hatch in the flight compartment, two passenger doors and an emergency door in the cabin, a ramp door at the aft end of the cabin, and a cargo door in the rear fuselage.

In addition, the cabin may be isolated from the flight compartment by a cabin flight compartment door and from the rear fuselage by a draftproof door.

DRAFTPROOF DOOR

A folding, upholstered, draftproof door is fitted in the rear fuselage immediately aft of the passenger doors, consisting of three hinged panels which when extended separate the cabin from the rear fuselage, and which may be folded in accordian fashion to stow in the roof of the rear fuselage. Whenever the cargo door jettison gear is operated, the upper catches of the draftproof door are tripped and the draftproof door automatically folds up.

DIRECTED STUDY PROGRAM

Page: 4

DHC - 4

Ref.: 1080-1

CARGO DOOR

Located in the rear fuselage immediately aft of the ramp door, constructed in two half-sections which are joined together along the centerline by a hinge pin. Each section comprises a honeycomb sandwich skin panel strengthened by transverse ribs and stiffeners. A fore-and-aft tubular control rod is connected to a jettison release cable. A sealing tube is attached to the door edges and is pressurized by outside air via a rubber tube so that when the door is closed it is sealed against the fuselage and the aft edge of the ramp door. Two hinges at the aft end enable the door to pivot up to either a fully up position near the roof of the rear fuselage or to any intermediate position. Actuation of the door is accomplished by a chain and cable system connected to push rods clamped to either side of the door, which is driven by an electrical actuator or by handcranking.

CARGO DOOR OPERATING GEAR

A chain and cable system driven either by a 28-volt dc cargo door actuator or by a cargo door manual control handle connected to the actuator gearing, is controlled by a master switch on the flight compartment circuit breaker panel and from the cargo doors control panel in the cabin. The cargo door manual control handle extends forward from the actuator and is spring-loaded in the disengaged position. To engage the actuator, the handle must be pivoted against the spring loading and turned clockwise to raise the door and counterclockwise to lower it. Microswitches limit the travel of the door, while down locks at the left and right forward attachment points hold the door firmly in the down (closed) position.

CARGO DOOR CONTROL PANEL

Inset in the cabin roof above the left passenger door, the panel contains toggle switches marked CARGO DOOR and RAMP DOOR which are spring-loaded to a center off position between OPEN and CLOSE selections, and circuit breakers to protect the cargo door and ramp door circuits against overloading.

CARGO DOOR ACTUATOR

On the left side of the rear fuselage, it operates at 28-volt dc supplied from the main bus. The motor operates both clockwise and counterclockwise, with an integral magnetic brake for immediate stopping of the motor when the current is switched off; i.e., when the cargo door switch is released or when the limiting microswitches are tripped. A slip clutch keyed to the output shaft is held against a sprocket driving the chain and cable system and is set to slip at 800-900 inch-pounds to prevent overloading the motor.

A spring-loaded disconnect shaft within a tubular driving shaft protrudes from the actuator, and both shafts are operated by a cargo door manual control handle. Pivoting the cargo door manual control handle against the spring loading of the disconnect shaft causes the shaft to disengage from the motor and engage with the driving shaft. At the same time, the manual control handle locks into the driving shaft to allow the door to be raised or lowered by handcranking.

DIRECTED STUDY PROGRAM

Page: 5

DHC - 4

Ref.: 1080-1

CARGO DOOR JETTISON GEAR

Cable operated from either one of two cargo door jettison handles, one handle is positioned inside the cabin immediately aft of the left passenger door, while the other handle is accessible from the outside of the rear fuselage aft of the right passenger door. Both handles are connected by cables to a common bellcrank mounted above the inside handle.

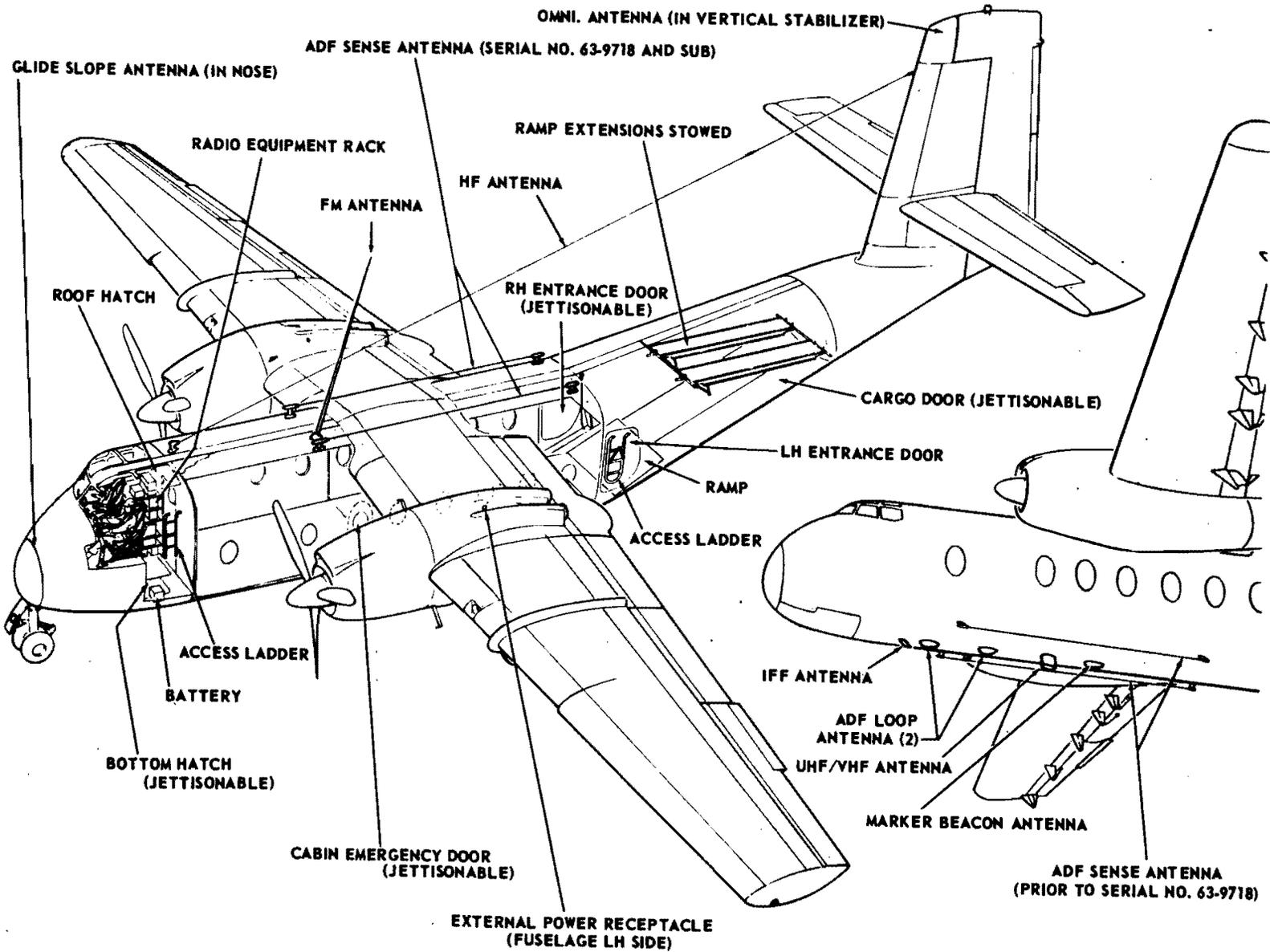
1. A _____ panel folding draft proof door stows in the roof of the _____.	
2. The cargo door is self sealing by a rubber tube which is pressurized by _____.	three; aft fuselage
3. Cargo door has two jettison handles, one inside _____, and one outside _____.	ram air
4. When either jettison handle is pulled, it also trips the _____ which folds up.	aft of L door; aft of R door
5. The cargo door control panel is located above the _____.	draft proof door
6. _____ protects the cargo door circuit from overload.	left cabin door
7. The cargo door is operated by a _____ motor from the _____ bus.	circuit breakers
8. There are _____ limit micro-switches to stop the motor.	28 VDC; main
9. A spring-loaded cranking disconnect allows _____ of the cargo door.	two
10. The system is also protected by a _____ keyed to the output shaft.	manual operation
	slip clutch

DIRECTED STUDY PROGRAM

DHC - 4

Page: 6

Ref.: 1080-1



General arrangement

DIRECTED STUDY PROGRAM

Page: 7

DHC - 4

Ref.: 1080-1

RAMP DOOR

The ramp door may be raised and lowered through a maximum range of 70 degrees by two screw jacks pivot-mounted on the rear fuselage. The jacks are driven by bevel gear units through torque tubes from either a 28-volt dc ramp door actuator or by a handcrank. The handcrank is normally stowed in clips on the left wall of the rear fuselage, and connects into a fitting in the roof. The handcranking system of torque tubes and bevel gear units is an off-shoot from the main lateral torque tube driven from the actuator, and cannot be used until a disconnect knob on the actuator is depressed and locked in by turning it through 180 degrees. Power for the actuator is supplied from the main bus and is controlled by the master cargo door switch on the flight compartment circuit breaker panel, and from the cargo doors control panel.

Microswitches are provided for the closed, horizontal, and open positions of the ramp door and a microswitch for the doors unlocked warning light. The switches are tripped by a nut which rides along the thread whenever the torque tubes are rotated. A weight switch on the nose gear shock strut, wired to the horizontal limit switch, prevents the ramp door being lowered below the horizontal position when the nose gear is clear of the ground.

RAMP DOOR ACTUATOR

Operates at 28 volts dc supplied from the main bus. The motor has a split field with reversible windings for both clockwise and counterclockwise rotation, and an integral magnetic brake for immediate braking of the motor when the current is switched off; i.e., when the ramp door switch is released or when the limiting microswitches are tripped. An output shaft is geared to the motor but may be disengaged for handcranking by a clutch arrangement operated from a knob (protruding from the face plate) which will push in and turn through 180 degrees, disconnecting the output shaft from the motor.

- | | |
|---|-----------------------------|
| 1. The ramp door may be operated by either a _____ motor or _____. | |
| 2. Before handcranking the motor must be disconnected by _____ a knob and rotating it _____ degrees. | 28 VDC;
handcrank |
| 3. Power is supplied from the _____ bus, and is controlled by either the _____ on the circuit breaker panel or the main control panel located above the cabin entrance. | depressing;
180 |
| 4. Ramp door movement is limited by microswitches to the _____, _____, and _____ positions. | main;
master switch |
| 5. Maximum range of movement is _____ degrees. | open; horizontal;
closed |

DIRECTED STUDY PROGRAM

DHC - 4

Page: 8

Ref.: 1080-1

6. The handcrank is stowed on the _____ side of the rear cabin. There is a socket fitting located in the _____.

70

7. The motor is a split field, _____ type with an integral _____ brake.

left;
cabin roof

reversible;
magnetic

PASSENGER DOORS

Left and right passenger doors are provided at the aft end of the cabin.

A ladder which may be attached to the sill of either left or right passenger door, is stowed on the inside of the left door when not in use. The upper ends of the ladder fit into holes near the top of the door inside panel, while the lower end is held to the door by elastic cord.

The jettisonable door on the left side of the cabin wall, has an elliptical window formed from two sheets of plastic, permanently cemented together at the edges to provide an insulating inner airspace, the same type as that used for the flight compartment floor hatch; but, in addition, the inboard handle is protected against inadvertent operation by a spring-loaded cover which, when raised, depresses the release button and allows the handle to be turned to withdraw the pins and jettison the door.

CABIN WINDOWS

Sixteen windows in the walls of the cabin are positioned eight to a side, including one window in the cabin emergency door. Each window consists of two panels of acrylic plastic which are cemented to each other at the edges to enclose a dehumidified air space.

1. There are _____ aft cabin doors of which only the _____ door can be jettisoned.

2. A ladder stowed on the _____ door can be used on either side of the aircraft.

two;
right

3. A jettison handle on the _____ cabin wall is protected by a spring-loaded cover.

left

4. Raising the cover _____ a release button that allows the handle to be turned and the _____ pulled.

left

DIRECTED STUDY PROGRAM

Page: 9

DHC - 4

Ref.: 1080-1

depresses;
pins

FLIGHT COMPARTMENT

A ladder is stowed in the flight compartment just forward of the bulkhead. In its stowed position the ladder may be used for exit through the flight compartment roof hatch, or may be lowered and used for entrance or exit through the flight compartment floor hatch.

FLIGHT COMPARTMENT EMERGENCY SLIDE

Made from webbing, coiled against the forward face of the flight compartment bulkhead and is held in position by tape, the slide when completely uncoiled may be used to reach the ground after climbing through the flight compartment roof hatch.

FLIGHT COMPARTMENT FLOOR HATCH

A rectangular escape well consisting of two hinged doors (the upper hatch) in the flight compartment floor, and a jettisonable hinged door (the lower hatch) flush with the underside of the fuselage skin.

The upper hatch doors hinge upwards to provide access to the operating handle of the lower hatch.

The lower hatch door is hinged at its forward edge and is held in the closed position by a tapered bolt which fits into a recess on the aft edge of the hatch well. The bolt action is controlled from either of two handles attached to each end of a rod passing through the hatch door.

A PRESS button beside each handle, when pressed, releases a locking pin in the handle rod and allows a coil spring to force the handles downward to the unlocked position. From this position either handle may be turned to withdraw the tapered bolt and open the hatch.

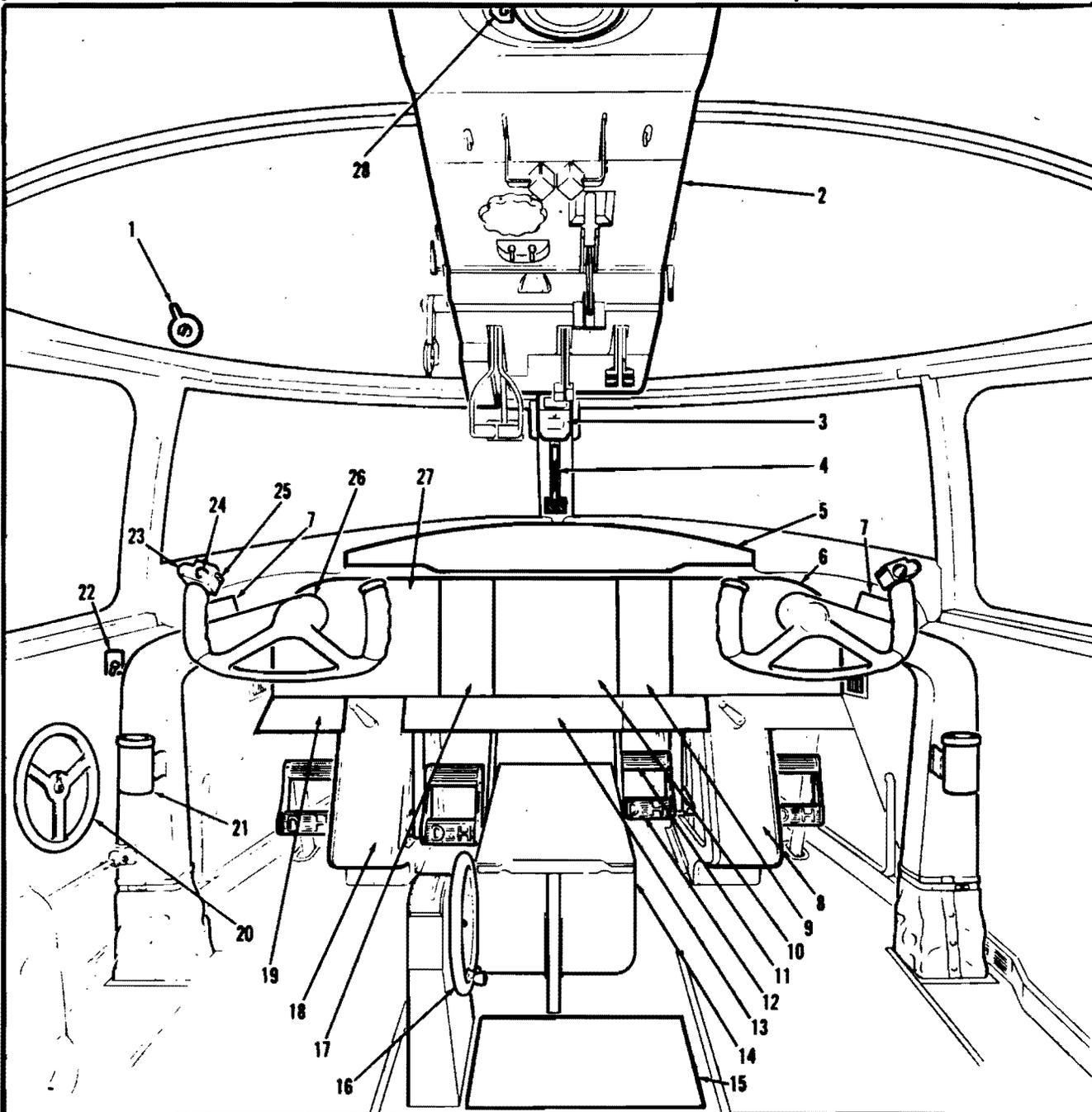
A short stay is provided to hold the upper hatch door in the open position; one end of the stay is hinged to the door, while the free end locks into a key-hole slot in the wall of the well. Movement of the tapered bolt also actuated twin microswitch contacts for the doors unlocked light circuit and the hatch light circuit.

DIRECTED STUDY PROGRAM

DHC - 4

Page: 10

Ref.: 1080-1



- | | |
|--|---|
| 1. OUTSIDE AIR TEMPERATURE GAGE | 15. HYDRAULIC EMERGENCY SELECTOR PANEL |
| 2. OVERHEAD CONSOLE | 16. ELEVATOR TRIM TAB HANDWHEEL |
| 3. STANDBY (MAGNETIC) COMPASS | 17. FUEL PANEL |
| 4. WHEEL BRAKES EMERGENCY LEVER | 18. PILOT'S PEDESTAL |
| 5. EMERGENCY PANEL | 19. ENGINE SWITCH PANEL |
| 6. COPILOT'S FLIGHT INSTRUMENT PANEL | 20. NOSEWHEEL STEERING WHEEL |
| 7. STICK SHAKER | 21. ASH TRAY |
| 8. COPILOT'S PEDESTAL | 22. NOSEWHEEL STEERING SWITCH |
| 9. VOLTAMMETER, AC-DC POWER & DEICING PANELS | 23. AUTO PILOT RELEASE BUTTON (PROVISION) |
| 10. ENGINE INSTRUMENT PANEL | 24. AILERON TRIM TAB SWITCH |
| 11. BRAKE PEDALS | 25. MICROPHONE SWITCH |
| 12. RUDDER PEDALS | 26. CONTROL COLUMN |
| 13. ELECTRICAL SWITCH PANELS | 27. PILOT'S FLIGHT INSTRUMENT PANEL |
| 14. SLIDING CONSOLE | 28. DOME LIGHT AND SWITCH |

47C-124

DIRECTED STUDY PROGRAM

DHC - 4

Page: 11

Ref.: 1080-1

1. A ladder stowed on the flight compartment bulkhead may be used for either the _____ hatch or the _____ escape hatch.	
2. The lower escape well consists of _____ hinged doors, the _____ door being jettisonable.	overhead; floor
3. Raising the _____ door provides access to the jettison handle of the lower hatch.	two; bottom
4. A push button beside each handle must be depressed to _____ the handles for turning.	upper
5. Either of the two handles will pull a _____ on the _____ edge of the door.	unlock
6. A stay rod for the _____ door must be positioned in a slot _____ to jettisoning the lower hatch.	tapered pin; aft
	upper; prior

WINDSHIELD

Constructed of two layers of plastic*, treated with an electrically-conductive transparent coating which is heated to 100°F by alternating current passing between bus bars embedded between the upper and lower edges of the outer two layers. This prevents both icing and fogging of the transparent areas and at the same time maintains flexibility of the windshields to provide birdproofing qualities. Single phase, alternating current is supplied from windshield inverters operating on 28 volts dc supply from the secondary bus. Heating of the windshield is controlled by a rotary switch (on the left side of the center switch panel) having three positions marked NORM, OFF, and EMERG. Two amber-colored windshield power failure lights are positioned below the rotary switch and are labeled PILOTS and COPILOTS. In the event of power failure of the pilot's inverter, power can be switched over from the copilot's inverter to the pilot's windshield by selecting EMERG.

* Plastic is standard, however, our Company A/C are equipped with two layers of glass.

DIRECTED STUDY PROGRAM

DHC - 4

Page: 12

Ref.: 1080-1

1. The windshield contains _____ bus bars for electrical de-icing.

2. Two _____ AC inverters supply current to maintain _____ °F.

two

3. Power for the two windshield inverters are supplied from the _____ bus.

single phase;
100

4. A rotary switch is wired _____, _____, and _____ controls windshield heating.

secondary

5. In the _____ position the copilot's inverter supplies power for the pilot's windshield and the copilot's side becomes _____.

NORM;
OFF;
EMERG

6. Two amber-colored warning lights are located below the rotary switch to indicate _____ failure.

EMERGENCY;
inoperative

inverter

WING GROUP

The wing consists of a center section, which is permanently attached to the center fuselage by spar attachment fittings and riveted joints, and removable left-hand and right-hand outer wing panels. The wings are of the inverted gull type, the center section having negative dihedral and the outer wings positive dihedral. Provision is made for the fitting of removable leading edges, and for the fitting of the flap-aileron system at the trailing edge. Fuel cells are contained within the wing structure between ribs.

The wing center section structure is symmetrical about a main center rib and comprises a front spar, a rear spar, ribs, flap shrouds, and skins reinforced by spanwise stringers. A nacelle is permanently attached to the center section. Landing gear attachment fittings are secured to the structure in the nacelle area.

The nacelle on each side of the aircraft comprises a main firewall assembly, a top structure, inboard and outboard curtain walls, and a nacelle rear cooler together with its ducts and duct flaps. The top skin panels are removable to allow access to these components.

DIRECTED STUDY PROGRAM

DHC - 4

Page: 13

Ref.: 1080-1

The outer wing leading edge is in four sections; a fixed leading edge at the inboard end, two hinged leading edges, and a short leading edge extension near the tip. A stall fence is fitted to the top skin and the leading edge. A flap shroud is riveted to the rear spar. Fuel cell compartments are located in the outer wing.

Each wing tip consists of a molded fiberglass skin, stiffened by a rib and reinforcing angles. A mounting plate for the installation of a navigation light is bonded to the front edge of the tip. The tip is secured to the outboard rib of the outer wing by screws.

1. The wing is of the inverted _____ type.	
2. The nacelles are permanently attached to the wing _____ section.	gull
3. Design strength of the wing is improved by the placement of _____ cells.	center
4. The top nacelle section contains two _____ tubes.	fuel
	augment or

DIRECTED STUDY PROGRAM

DHC - 4

Page: 1

Ref.: 1080-2

LIMITATIONS

DISREGARD

WEIGHT LIMITATIONS

OUTDATED

- A. MAXIMUM TAKE-OFF GROSS WEIGHT 28,500 LBS.
- B. MAXIMUM LANDING WEIGHT 28,000 LBS.
- C. MAXIMUM ZERO FUEL WEIGHT 27,000 LBS.

Some aircraft are certified for higher gross weight.

- A. MAXIMUM TAKE-OFF GROSS WEIGHT 29,925 LBS.
- B. MAXIMUM LANDING WEIGHT 28,500 LBS.
- C. MAXIMUM ZERO FUEL WEIGHT 28,000 LBS.

All weight in excess of maximum zero fuel weight must consist of fuel. Fuel must be distributed equally on both sides of the aircraft centerline.

PERFORMANCE LIMITATIONS

In many instances it is necessary to limit the maximum permissible gross weight, not because of structural limits but because the aircraft will not perform with a reasonable margin of safety at higher gross weight.

AIRSPPEED LIMITATIONS

The instrument limit marking and other speeds noted in this chapter, show indicated airspeed values. They are applicable to the airspeed indicator (Captains) without instrument error.

(1) FLAP LOWERING SPEED LIMITATIONS

FLAP SETTING (All Engine Powers)	MAX. AIRSPEED IAS-KNOTS
0-15°	105
20°	95
30°	85
40°	80

(2) MANEUVERING SPEED (V_a)

Maneuvers which involve full application of rudder or aileron must be confined to speeds below 119 knots IAS. This is also the maximum penetration airspeed, and should not be exceeded when flying in turbulent air.

DIRECTED STUDY PROGRAM

Page: 2

DHC - 4

Ref.: 1080-2

(3) NORMAL OPERATING SPEED (V_{no})

The normal operating speed below 10,000 feet is 165 knots IAS. Above 10,000 feet the IAS must be reduced by 3 knots for each 1000 feet increase in altitude.

(4) NEVER EXCEED SPEED (V_{ne})

The never exceed speed below 10,000 feet is 208 knots IAS. Above 10,000 feet the IAS must be reduced by approximately 1 knot for each 1000 feet increase in altitude.

(5) LANDING GEAR OPERATING SPEED (V_{lo})

The maximum speed for extending or retracting the landing gear, or flying with gear down is 120 knots IAS.

(6) MINIMUM CONTROL SPEED (V_{mc})

Minimum control speed at sea level is 66 knots IAS with 15° of flap and 70 knots with 30° of flap.

(7) PROHIBITED MANEUVERS

All aerobatics are prohibited. To clarify the meaning of aerobatics, the following list details maneuvers that are prohibited.

- a. Loops
- b. Rolls
- c. Spins
- d. Steep turns above 60° bank angle
- e. Stall turns
- f. Stalls - Except under certain conditions
- g. Abrupt maneuvers involving full control deflection at airspeeds above 119 knots.
- h. Inverted maneuvers.

ENGINE OPERATION LIMITS

(A) GENERAL STATEMENT

The operating 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 the 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

DIRECTED STUDY PROGRAM

Page: 3

DHC - 4

Ref.: 1080-2

to enhance consistent trouble-free operation by reducing the chances of approaching marginal conditions.

(B) OPERATION LIMITS

(1) MANIFOLD PRESSURE

A. TAKE-OFF (5 MIN MAX)

<u>BHP</u>	<u>RPM</u>	<u>MP (in Hg)</u>	<u>PRESSURE ALTITUDE</u>
1450	2700	50.0	SEA LEVEL
1450	2700	49.5	3500 FT

B. METO (MAXIMUM EXCEPT TAKE-OFF)

1200	2550	42.5	SEA LEVEL
1200	2550	41.5	7000 FT

C. MAXIMUM CONTINUOUS POWER

1200	2550	42.5	SEA LEVEL
1200	2550	41.5	7000 FT

(2) RPM

A. TAKE-OFF	2700
B. HIGH PITCH	1200
C. GROUND POWER CHECK AT FIELD BAROMETRIC PRESSURE	2200 ± 50
D. IGNITION CHECK RPM DROP	100 RPM
E. IDLING	550 ± 50 RPM
F. AUTO LEAN PERMITTED	1700 - 2200 RPM
G. AUTO RICH REQUIRED	2200 - 2700 RPM
H. PROHIBITED, EXCEPT PASSING THROUGH - 2310 - 2510 & 1550 - 1750 RPM	
I. MAG SAFETY CHECK	1000 RPM

(3) FUEL PRESSURES

A. DESIRED	17 PSI
B. MINIMUM FOR CRUISE	16 PSI
C. MAXIMUM FOR CRUISE	18 PSI

(4) OIL PRESSURES

A. NORMAL RANGE	45 - 90 PSI
B. MINIMUM AT 1400 RPM	45 PSI
C. MAXIMUM AT 2700 RPM	110 PSI
D. MINIMUM IDLING	15 PSI
E. WARNING LIGHT	45 PSI
F. MINIMUM OIL PRESS AT CRUISING	65 PSI
G. MINIMUM AT TAKE-OFF	80 PSI

DIRECTED STUDY PROGRAM

Page: 4

DHC - 4

Ref.: 1080-2

(5) OIL TEMPERATURES

- A. NORMAL 60°C - 75°C
- B. MINIMUM FOR RUN-UP 40°C
- C. MAXIMUM (TAKE-OFF/CLIMB) 93°C
- D. MAXIMUM OIL INLET 93°C

(6) CYLINDER HEAD TEMPERATURES

- A. MINIMUM FOR TAXI 100°C
 - B. MINIMUM FOR ENGINE RUN-UP 120°C
 - C. MAXIMUM BEFORE TAKE-OFF 170°C
 - D. MAXIMUM FOR AUTO LEAN OPERATION 232.2°C
 - E. MAXIMUM 260°C
 - F. MAXIMUM FOR ENGINE SHUTDOWN 200°C
- 1 hour limit with 41.5 in.Hg (42.5 in.Hg at Sea Level) and 2550 RPM

(7) CARBURETOR AIR TEMPERATURE

- A. -30°C TO +10°C UNDESIRABLE CONDITION MAY EXIST, DEPENDING ON ATMOSPHERIC CONDITIONS.
- B. -30°C TO +38°C BEST OPERATING CONDITION, DEPENDING ON ATMOSPHERIC CONDITIONS. (MAXIMUM 38°C WHEN USING CARB. HEAT)
- C. +50°C MAXIMUM - DANGER OF DETONATION (MAXIMUM WITHOUT CARB. HEAT)

ENGINE OVERSPEED

Whenever engine speed exceeds a limit of 2800 RPM, the aircraft should be landed as soon as possible. An engine inspection is a requirement under these conditions. Removal of the engine is mandatory when RPM exceeds 3050.

NOTE: Momentary overspeed on surge within the 2800-3050 RPM range, as result of abnormally fast throttle movement is permissible without inspecting the engine.

ENGINE OVERBOOST

1. An overboost condition which requires an engine inspection exists when either one or both of the following conditions exist.
 - a. Engine operation, above 2200 RPM, with manifold pressure exceeding 54.5 in.Hg.
 - b. Engine operation, above 2200 RPM, with manifold pressure exceeding 50.0 in.Hg. for more than 15 seconds.

DIRECTED STUDY PROGRAM

Page: 5

DHC - 4

Ref.: 1080-2

2. Engine overboost must be recorded in the aircraft log book and should contain the following information:
 - a. Engine speed.
 - b. Manifold pressure.
 - c. Duration of overboost.
 - d. Cylinder head temperature.
 - e. Carburetor air temperature.
 - f. Oil temperature and pressure.

CENTER OF GRAVITY LIMITATIONS

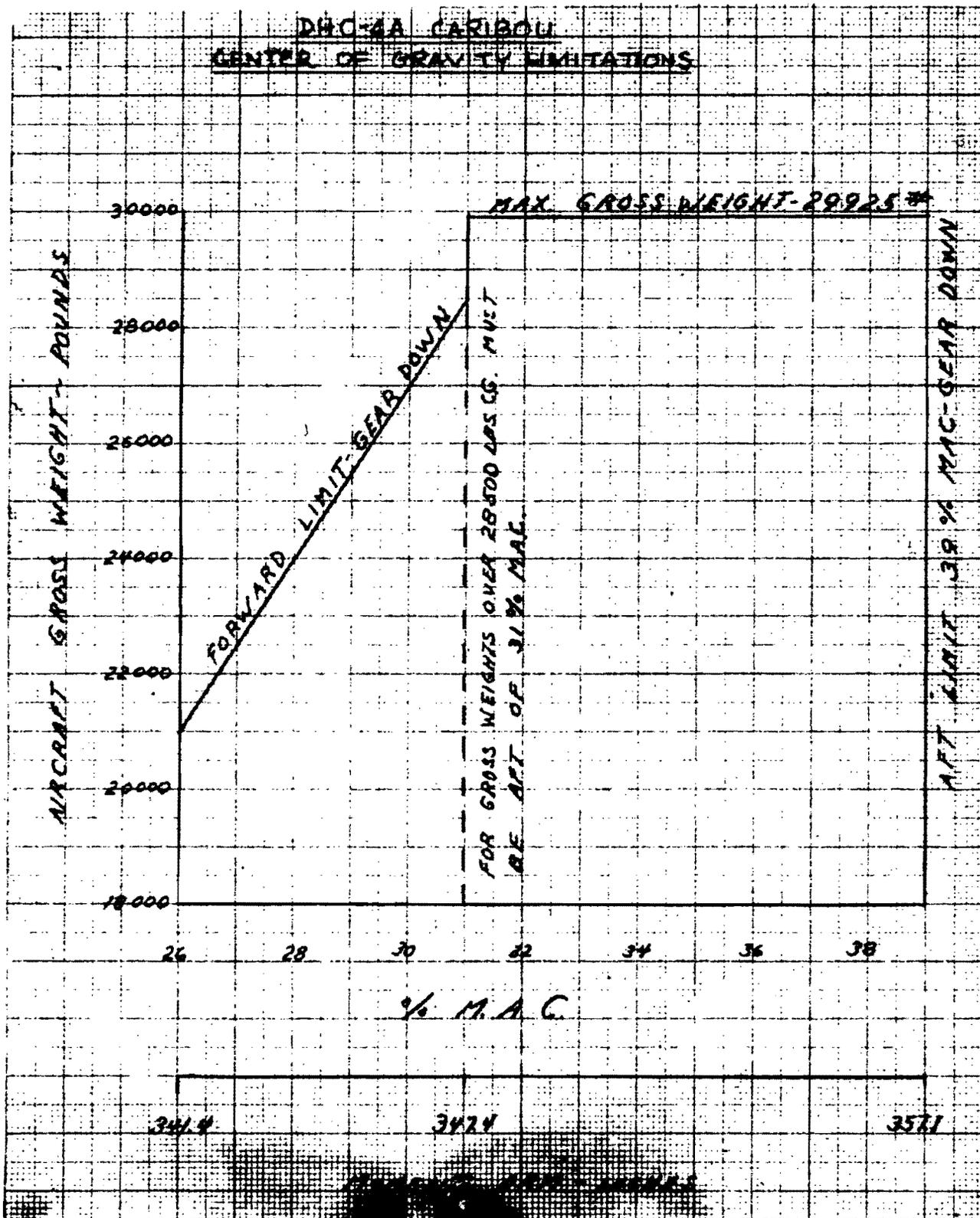
When loading the aircraft, particular attention should be paid to keeping the center of gravity within the prescribed limits shown on the proper charts. With the CG at its forward limit the stalling speed of the aircraft is its highest value. With CG at the aft limit with power for zero thrust, there is some deterioration in the stall characteristics, although the actual stalling speed is slightly lower. There is no effect on taxiing with the CG at either the fore or aft limit.

DIRECTED STUDY PROGRAM

Page: 6

DHC - 4

Ref.: 1080-2



DIRECTED STUDY PROGRAM

Page: 7

DHC - 4

Ref.: 1080-2

PERFORMANCE

Sample standard performance charts were selected from the appendix of the Air America flight manual to illustrate the use of performance data provided.

GENERAL

Two complete sets of performance charts are provided, one set covers aircraft in the weight range of 20,000-26,000 lb using Flap Configuration (A); while the other set covers aircraft in the weight range of 20,000-28,500 lb, using Flap Configuration (B). Standard charts are also included. Provided the gross weight limitations for the three groups of flap angles are observed, then either group may be used as appropriate in order to obtain the best performance under the existing conditions.

All airspeeds are given in CAS or TAS, except that IAS is given for take-off and landing data which allows for primary system airspeed calibrations. All airspeeds quoted throughout the manual are applicable to either airspeed indicator. Data basis, either flight test or estimated, is stated in the title block of each chart. The date of data determination is also stated. Unless otherwise noted, the charts are based on zero wind and ICAO standard atmosphere (ISA). Where possible, performance is summarized in tabular form on the relevant chart for gross weights of 26,000 and 23,000 lb (Configuration (A)) and 28,500, 26,000 and 23,000 lb (Configuration (B)).

Aircraft configuration and weight. The aircraft configuration and gross weight is presented on all charts.

STANDARD CHARTS The following paragraphs discuss the standard meteorological charts used.

Standard Atmosphere Table. The Standard Atmosphere Table shows standard atmosphere values, as defined by ICAO, and represents an approximation of the average atmosphere of the world. The ICAO assumes a temperature of 59°F (15°C) and a pressure of 29.92 in.Hg for sea level conditions. The temperature decrease with height is approximately 3.5°F (2°C) per 1000 feet from sea level to 35,000 feet.

Density Altitude Chart. The Density Altitude Chart provides a means of determining density altitude for a given temperature and pressure altitude. To find density, enter the chart at the temperature scale, and proceed vertically to the given pressure altitude, then horizontally to the left to the density altitude scale. Project horizontally to the right and find the conversion factor ($1/\sqrt{\sigma}$) which, when multiplied by CAS results in TAS.

DIRECTED STUDY PROGRAM

Page: 8

DHC - 4

Ref.: 1080-2

Psychrometric Chart. The Psychrometric Chart, provides the relationship between wet and dry bulb temperatures, dew point temperature, relative humidity, vapor pressure (in.Hg) and specific humidity. To find specific humidity, locate coinciding point of wet and dry bulb temperatures at correct pressure altitude. Project horizontally to the right for vapor pressure, and to the left for dew point. Continue horizontally to the left, then parallel to the nearest guide line to the correct pressure altitude, and read specific humidity.

POSITION ERROR CORRECTION CHARTS FOR INDICATED AIRSPEED. The position error correction to be applied to the indicated airspeed when the aircraft is accelerating on take-off with the wheels in contact with the runway. The correction to be applied when the aircraft is airborne and above the influence of ground effect. Ground effect is not considered significant above a height of 50 feet.

POSITION ERROR CORRECTIONS CHARTS FOR ALTIMETER enable the correction to be applied to the altimeter, at various speeds and configurations, to be determined.

ENGINE OPERATING LIMITS CHARTS. The engine operating limits in Auto Rich and Auto Lean mixture are given respectively. In each chart the sea level performance is given in the left-hand graph and the altitude performance in the right-hand graph. Use of the sea level graph is self explanatory. The altitude graph is plotted at constant rpm and full throttle, the brake horsepower is almost directly proportional to the density ratio. Accordingly lines of constant rpm are plotted on the graph, the horizontal scale being labeled with standard altitudes corresponding to their appropriate density ratios. Curves indicating full throttle manifold pressure are shown sloping diagonally upwards to the right. For a given rpm and manifold pressure the variation in BHP with altitude on a standard day may be found graphically. In the left-hand graph plot the given rpm and manifold pressure, then project horizontally to the right and find the sea level BHP. Enter the right-hand graph at this BHP at sea level and draw a straight line to the intersection of the given rpm and manifold pressure. Along this line the variation of BHP with alteration in altitude can be found up to the full throttle altitude. Above this altitude the given rpm line will have to be followed and the full throttle manifold pressure will start to decrease.

HUMIDITY CORRECTION FOR TAKE-OFF. It will be seen that the loss in take-off power due to the humidity at sea level may be restored by increasing the manifold pressure from the value given by the zero humidity line to that given by the appropriate humidity line.

BRAKE HORSEPOWER AVAILABLE FOR TAKE-OFF. The curves at the left of the reference line give the maximum BHP in dry air for conditions of altitude and temperature variation from standard day values (ISA). To the right of the reference line the reduction in BHP for various dew point temperatures may be found from the guide lines. The solid guide lines denote sea level and the dashed guide lines 10,000 feet. For intermediate altitudes the reduction in BHP must be found by interpolation.

DIRECTED STUDY PROGRAM

Page: 9

DHC - 4

Ref.: 1080-2

TAKE-OFF GROSS WEIGHT LIMITATION gives the gross weight at which a 100 feet per minute rate of climb can be maintained with one propeller feathered with one propeller feathered and the other engine operating at take-off power. The effect of flap setting, landing gear position and altitude at various gross weights are shown on the chart.

GROSSWIND COMPONENT CHART enables the effective crosswind component, and headwind component to be found. To find the crosswind component, the chart is entered with the wind velocity (using maximum gust velocity) and the wind angle relative to the runway. The headwind component is found by entering the chart with the steady wind velocity and wind angle relative to the runway. The maximum crosswind component tested for aircraft certification was 18 knots; however, this does not represent the critical value. Included on the charts is the recommended speed for take-off, and the recommended speeds for landing with various flap settings.

TAKE-OFF CURVES. Take-off distances determined from plotted curves are discussed in the following paragraphs.

Ground roll charts are provided to enable determination of the ground roll distance required from brake release to the point of take-off for various conditions of gross weight, temperature, wind and altitude. Take-off configuration is with both engines operating at take-off power, and flaps extended to 15° or 7° (normal technique) or, 30° or 25° (short field technique).

Total distance to clear 50 feet charts are provided to enable determination of the conversion of the ground roll to the total distance required from brake release to clearance of a 50-foot obstacle. The charts are based on the same take-off configurations, and enable determination of the total distance to clear 50 feet in the event of failure of one engine after take-off speed is attained.

Accelerate-stop distance charts are provided to enable determination of the distance required to stop the aircraft during the ground roll before attaining take-off speed, in the event of a malfunction of one engine. A reaction time of 2.5 seconds has been allowed for application of brakes and closing of both throttles after the engine failure occurs.

Stopping distance - aborted take-off charts are presented in terms of stopping distance in feet with correction curves for density altitude. Each chart is intended for use in take-off planning in determining the distance required to stop after an aborted take-off. The data is based on the use of brakes on a dry hard-surface runway, with flaps set at 15° or 30° (Configuration (A)), or 7° or 25° (Configuration (B)).

CLIMB-OUT CURVES. The use of charts for determining climb-out data is discussed in the following paragraphs.

DIRECTED STUDY PROGRAM

Page: 10

DHC - 4

Ref.: 1080-2

Normal technique (both engines operating) enables the horizontal distance traversed, and the height above the runway, at the five minute point to be determined.

Emergency technique (one propeller feathered) enables the distance traversed and height gained during landing gear retraction, and the distance traversed and height gained to the five minute point, to be determined. On reaching the five minute point, the engine power settings must be reduced to METO.

CLIMB CURVES. The use of charts for determining climb data is discussed in the following paragraphs.

Both engines operating at METO power enable the horizontal distance traversed and fuel consumed during the climb, and time to height, to be determined. The altitude at which the rate of climb is 100 feet per minute, relevant to the gross weight, is also shown.

One engine inoperative - Propeller feathered charts provide distance, fuel, and time data for climb with one engine operating at METO, and the propeller of the other engine feathered.

EMERGENCY CLIMB. The Emergency Climb charts enable the airspeed and rate of climb, with one engine inoperative and the propeller feathered, to be determined for various gross weights and configurations.

EMERGENCY CEILING. The Emergency Ceiling charts show the gross weight relevant to the altitude at which a 100 feet per minute rate of climb is possible with one engine operating at METO, and the propeller of the other engine feathered.

NAUTICAL MILES PER POUND OF FUEL. The following paragraphs discuss the charts used for determining distance/fuel consumption ratios.

Both engines operating charts define the nautical miles that can be traveled for each pound of fuel consumed, and are presented in terms of nautical miles per pound of fuel versus airspeed (TAS and CAS) for gross weights of 10,000 to 26,000 pounds and 20,000 to 28,500 pounds. The charts are based on altitudes from sea level to 20,000 feet, in increments of 5000 feet. Each chart shows the BHP necessary to attain a specific airspeed or fuel consumption, and also contains a table giving recommended engine power settings, mixture strength, and fuel consumption per engine, at various BHP. Dashed lines are shown, representing recommended long range, and recommended maximum endurance, from which the airspeed for a specific gross weight can be determined.

One engine inoperative - propeller feathered charts for altitudes from sea level to 10,000 feet in increments of 5000 feet define data similar, but with one engine inoperative and the propeller feathered.

DIRECTED STUDY PROGRAM

Page: 11

DHC - 4

Ref.: 1080-2

LONG RANGE SUMMARY. The Long Range Summary charts summarize the CAS, engine power settings, and nautical miles per pound of fuel, for various gross weights and altitudes.

MAXIMUM ENDURANCE. The Maximum Endurance charts enable the CAS, engine power settings, and fuel flow in pounds per hour, for various gross weights and altitudes, to be determined.

LONG RANGE PREDICTION. The Long Range Prediction charts are used to predict distance traveled and elapsed cruising time. The charts are presented in terms of gross weight versus distance and time, for ICAO standard day conditions.

DESCENT RANGE. The Descent Range charts enable the horizontal distance traveled in nautical miles, during an emergency descent, to be determined. A table included on each chart shows the recommended CAS at various gross weights from 20,000 to 26,000 pounds, and 20,000 to 28,500 pounds. The charts are based on the aircraft in the clean configuration with power off and both propellers feathered. An example is included in each chart.

LANDING DISTANCE. The following paragraphs discuss the charts used for ascertaining landing distance.

Ground roll charts are provided to enable determination of the ground roll distance required from touchdown to the point of stopping after landing, for various conditions of gross weight, temperature, wind, and altitude, with flap setting of 40°. Included in each chart is a graph from which the recommended approach speed (IAS) at 50 feet, relevant to the gross weight, can be obtained.

Landing distance from 50 feet charts are provided to enable determination of conversion of ground roll, as obtained to the total landing distance required from a height of 50 feet.

STALLING SPEED. The power off stalling speeds (CAS) with the center of gravity at the forward limit at gross weights from 20,000 to 28,500 pounds, with various configurations, can be obtained from the Stall Speed charts.

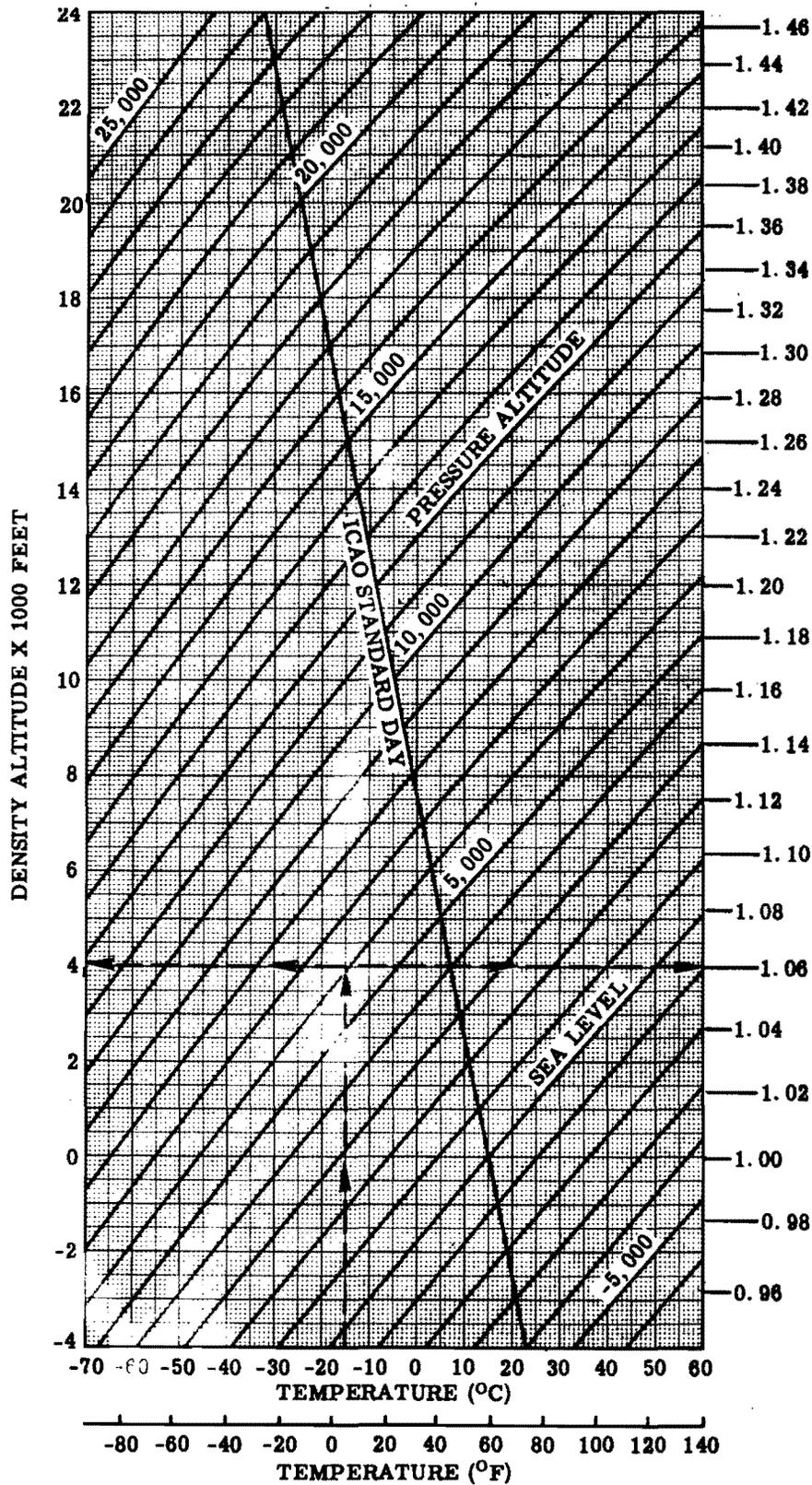
DIRECTED STUDY PROGRAM

Page: 12

DHC - 4

Ref.: 1080-2

DENSITY ALTITUDE CHART



DIRECTED STUDY PROGRAM

Page: 13

DHC - 4

Ref.: 1080-2

STANDARD ATMOSPHERE TABLE

STANDARD S L CONDITIONS:

TEMPERATURE 15°C (59°F)
 PRESSURE 29.921 IN. Hg 2116.216 LB/SQ FT
 DENSITY .0023769 SLUGS/CU FT
 SPEED OF SOUND 1116.89 FT/SEC 661.7 KNOTS

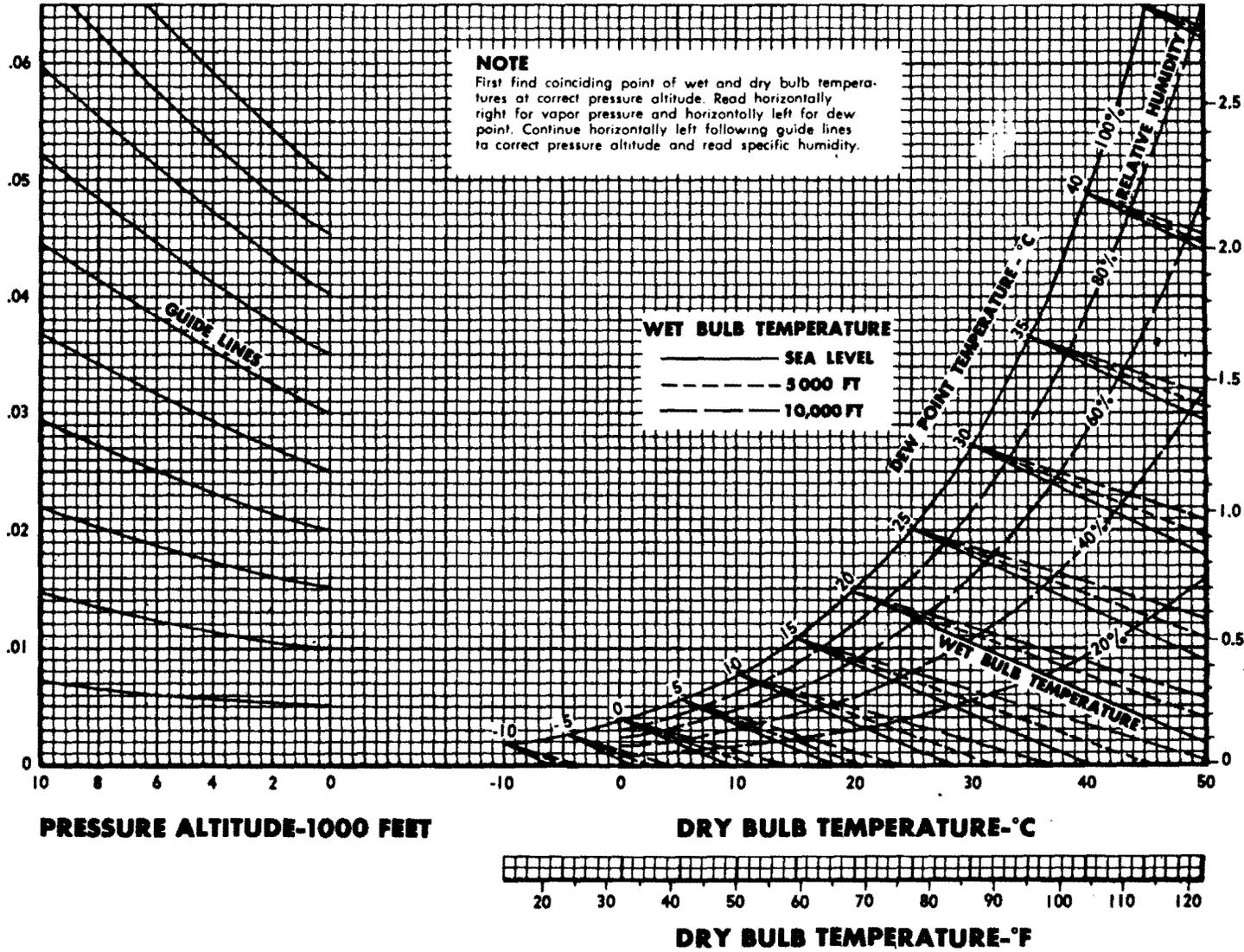
CONVERSION FACTORS:

1 IN. Hg 70.727 LB/SQ FT
 1 IN. Hg 0.49116 LB/SQ IN.
 1 KNOT 1.151 M P H
 1 KNOT 1.688 FT/SEC

ALTITUDE FEET	DENSITY RATIO σ	$\sigma^{-1/2}$ $\frac{1}{\sqrt{\sigma}}$	TEMPERATURE		SPEED OF SOUND KNOTS	PRESSURE IN. Hg	PRESSURE RATIO δ
			°C	°F			
0	1.0000	1.0000	15.000	59.000	661.7	29.921	1.0000
1000	.9711	1.0148	13.019	55.434	659.5	28.856	.9644
2000	.9428	1.0299	11.038	51.868	657.2	27.821	.9298
3000	.9151	1.0454	9.056	48.302	654.9	26.817	.8962
4000	.8881	1.0611	7.076	44.735	652.6	25.842	.8637
5000	.8617	1.0773	5.094	41.169	650.3	24.896	.8320
6000	.8359	1.0938	3.113	37.603	648.7	23.978	.8014
7000	.8106	1.1107	1.132	34.037	645.6	23.088	.7716
8000	.7860	1.1279	-0.850	30.471	643.3	22.225	.7428
9000	.7620	1.1456	-2.831	26.905	640.9	21.388	.7148
10,000	.7385	1.1637	-4.812	23.338	638.6	20.577	.6877
11,000	.7155	1.1822	-6.793	19.772	636.2	19.791	.6614
12,000	.6932	1.2011	-8.774	16.206	633.9	19.029	.6360
13,000	.6713	1.2205	-10.756	12.640	631.5	18.292	.6113
14,000	.6500	1.2403	-12.737	9.074	629.0	17.577	.5875
15,000	.6292	1.2606	-14.718	5.508	626.6	16.886	.5643
16,000	.6090	1.2815	-16.699	1.941	624.2	16.216	.5420
17,000	.5892	1.3028	-18.680	-1.625	621.8	15.569	.5203
18,000	.5699	1.3246	-20.662	-5.191	619.4	14.942	.4994
19,000	.5511	1.3470	-22.643	-8.757	617.0	14.336	.4791
20,000	.5328	1.3700	-24.624	-12.323	614.6	13.750	.4595
21,000	.5150	1.3935	-26.605	-15.889	612.1	13.184	.4406
22,000	.4976	1.4176	-28.587	-19.456	609.6	12.636	.4223
23,000	.4806	1.4424	-30.568	-23.022	607.1	12.107	.4046
24,000	.4642	1.4678	-32.549	-26.588	604.6	11.597	.3876
25,000	.4481	1.4938	-34.530	-30.154	602.1	11.103	.3711
26,000	.4325	1.5206	-36.511	-33.720	599.6	10.627	.3552
27,000	.4173	1.5480	-38.492	-37.286	597.1	10.168	.3398
28,000	.4025	1.5762	-40.474	-40.852	594.6	9.725	.3250
29,000	.3881	1.6052	-42.455	-44.419	592.1	9.297	.3107
30,000	.3741	1.6349	-44.436	-47.985	589.5	8.885	.2970

PSYCHROMETRIC CHART

SPECIFIC HUMIDITY-LB WATER VAPOR/LB DRY AIR



DIRECTED STUDY PROGRAM
 DHC - 4

Page: 14
 Ref.: 1080-2

DIRECTED STUDY PROGRAM

Page: 15

DHC - 4

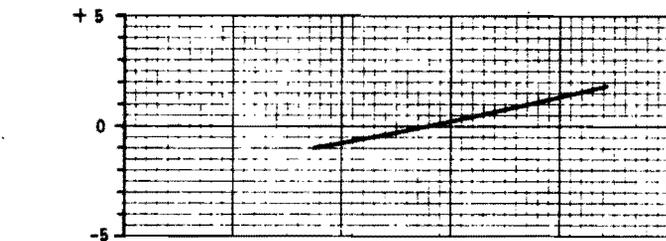
Ref.: 1080-2

POSITION ERROR CORRECTION TO INDICATED AIRSPEED ALL AIRCRAFT WEIGHTS - VARIOUS CONFIGURATIONS

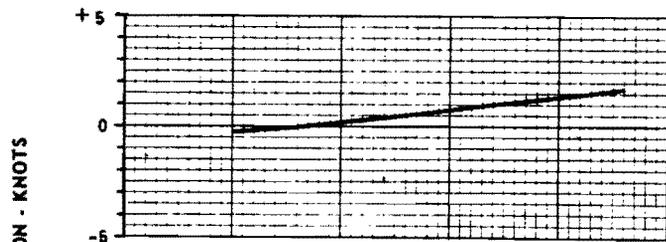
MODEL: CV-2
DATE: APRIL 1961
DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

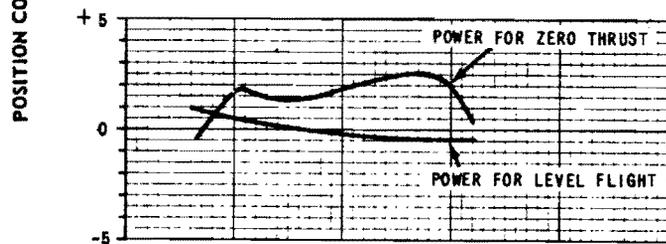
INDICATED AIRSPEED (IAS) = INSTRUMENT READING + INSTRUMENT CORRECTION
CALIBRATED AIRSPEED (CAS) = IAS + POSITION CORRECTION



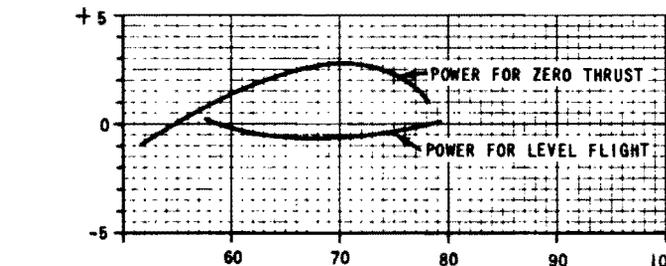
REMARKS:
FLAPS: 7°
LANDING GEAR: RETRACTED
POWER FOR LEVEL FLIGHT



REMARKS:
FLAPS: 14°
LANDING GEAR: RETRACTED
POWER FOR LEVEL FLIGHT



REMARKS:
FLAPS: 26° AND 30°
LANDING GEAR: EXTENDED



REMARKS:
FLAPS: 40°
LANDING GEAR: EXTENDED

INDICATED AIRSPEED - KNOTS

DIRECTED STUDY PROGRAM

Page: 16

DHC - 4

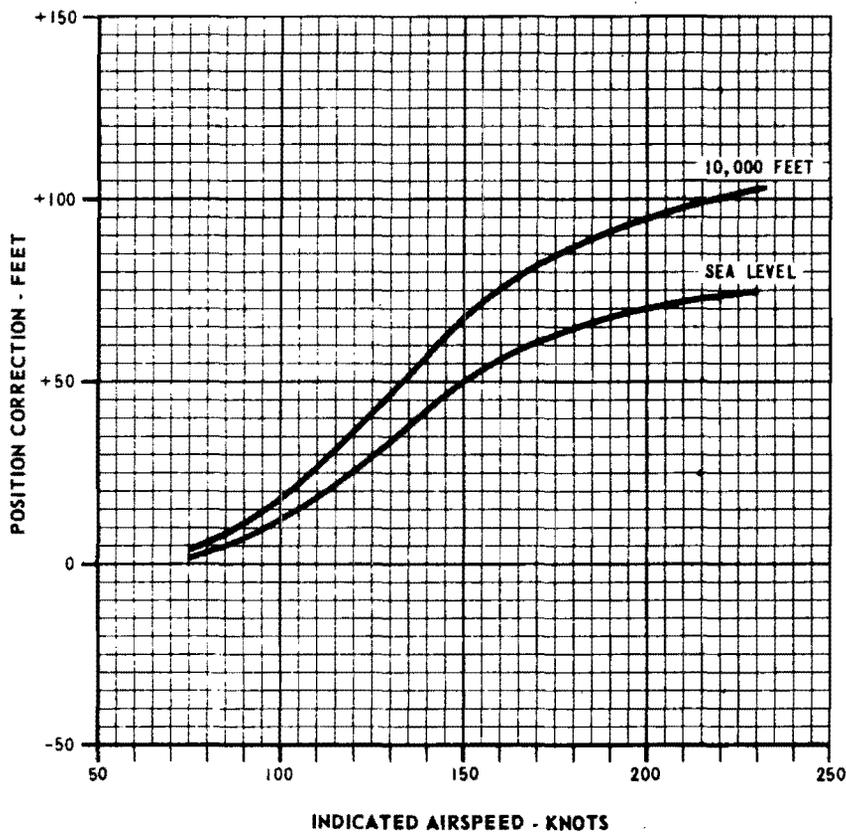
Ref.: 1080-2

POSITION ERROR CORRECTION TO ALTIMETER AIRCRAFT WEIGHT 28,500 LB. - CLEAN CONFIGURATION

MODEL: CV-2
DATE: MAY 1961
DATA BASIS: FL HT TEST (CONTRACTOR)

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

REMARKS:
POWER FOR LEVEL FLIGHT

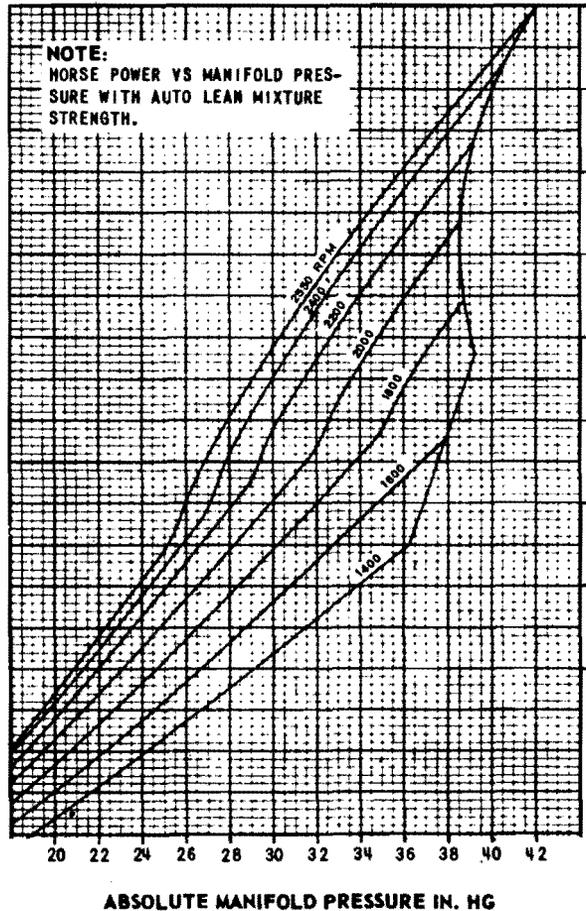


ENGINE OPERATING LIMITS AUTO LEAN

MODEL: CV-2
DATE: APRIL 1948
DATA BASIS: ENGINE CONTRACTOR

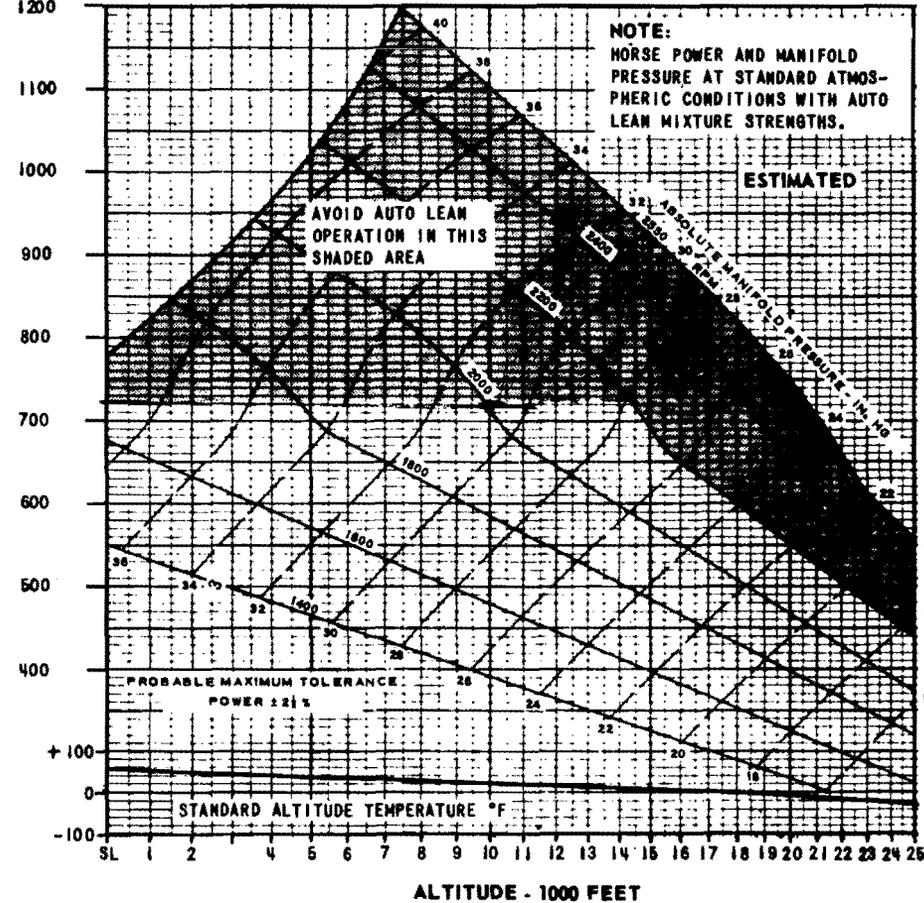
ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

SEA LEVEL CALIBRATION



BHP

ALTITUDE CALIBRATION



DIRECTED STUDY PROGRAM

DHC - 4

Page: 17

Ref.: 1080-2

AF-447 (SHT 2

DIRECTED STUDY PROGRAM

DHC - 4

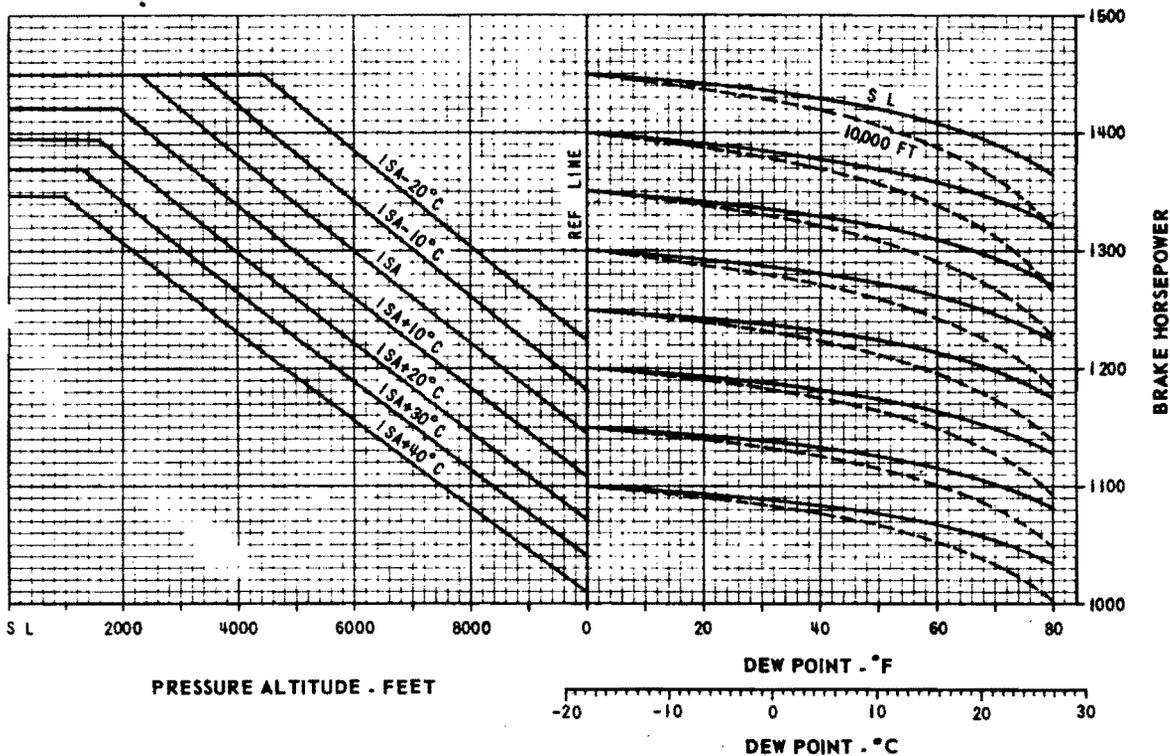
Page: 18

Ref.: 1080-2

BRAKE HORSEPOWER AVAILABLE FOR TAKE-OFF

MODEL: CV-2
DATE: OCTOBER 1960
DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL



DIRECTED STUDY PROGRAM

Page: 19

DHC - 4

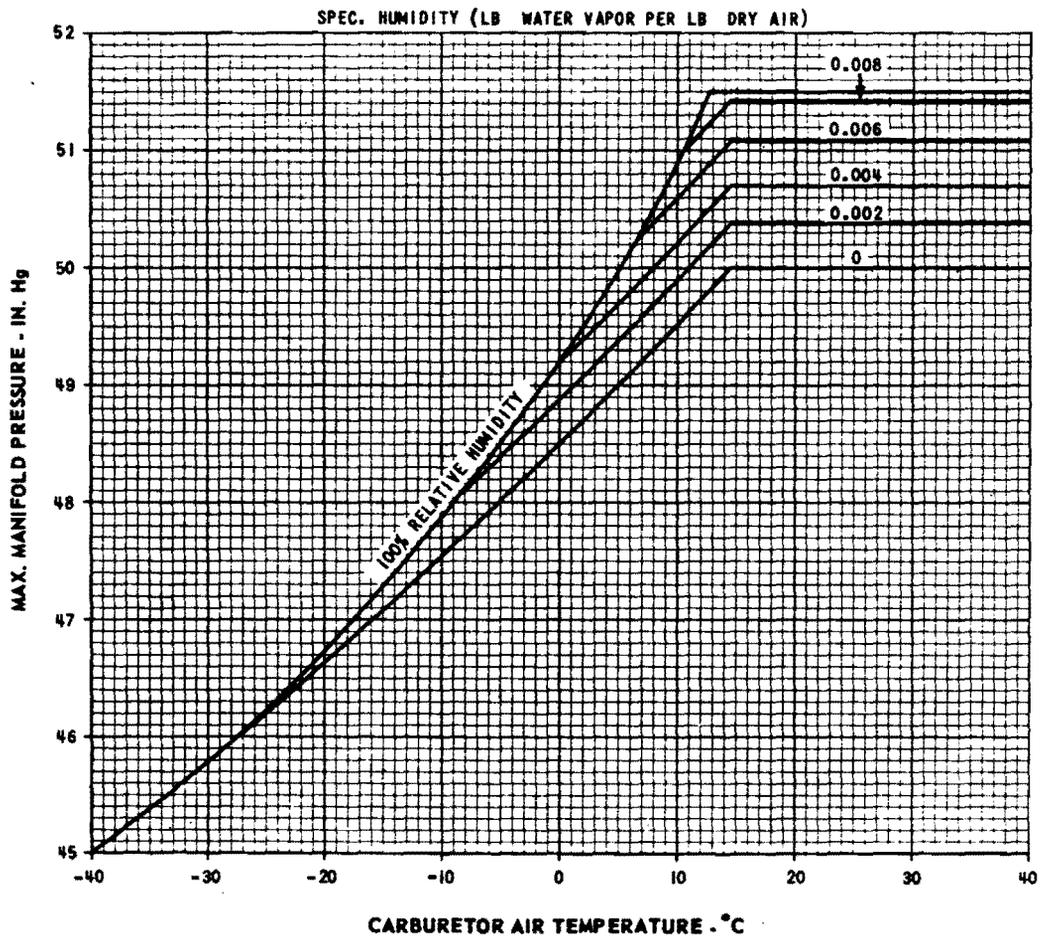
Ref.: 1080-2

HUMIDITY CORRECTION FOR TAKE-OFF SEA LEVEL

MODEL: CV-2
DATE: OCTOBER 1960
DATA BASIS: (ESTIMATED)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

NOTE: FOR PSYCHROMETRIC CHART SEE FIG. 14-3



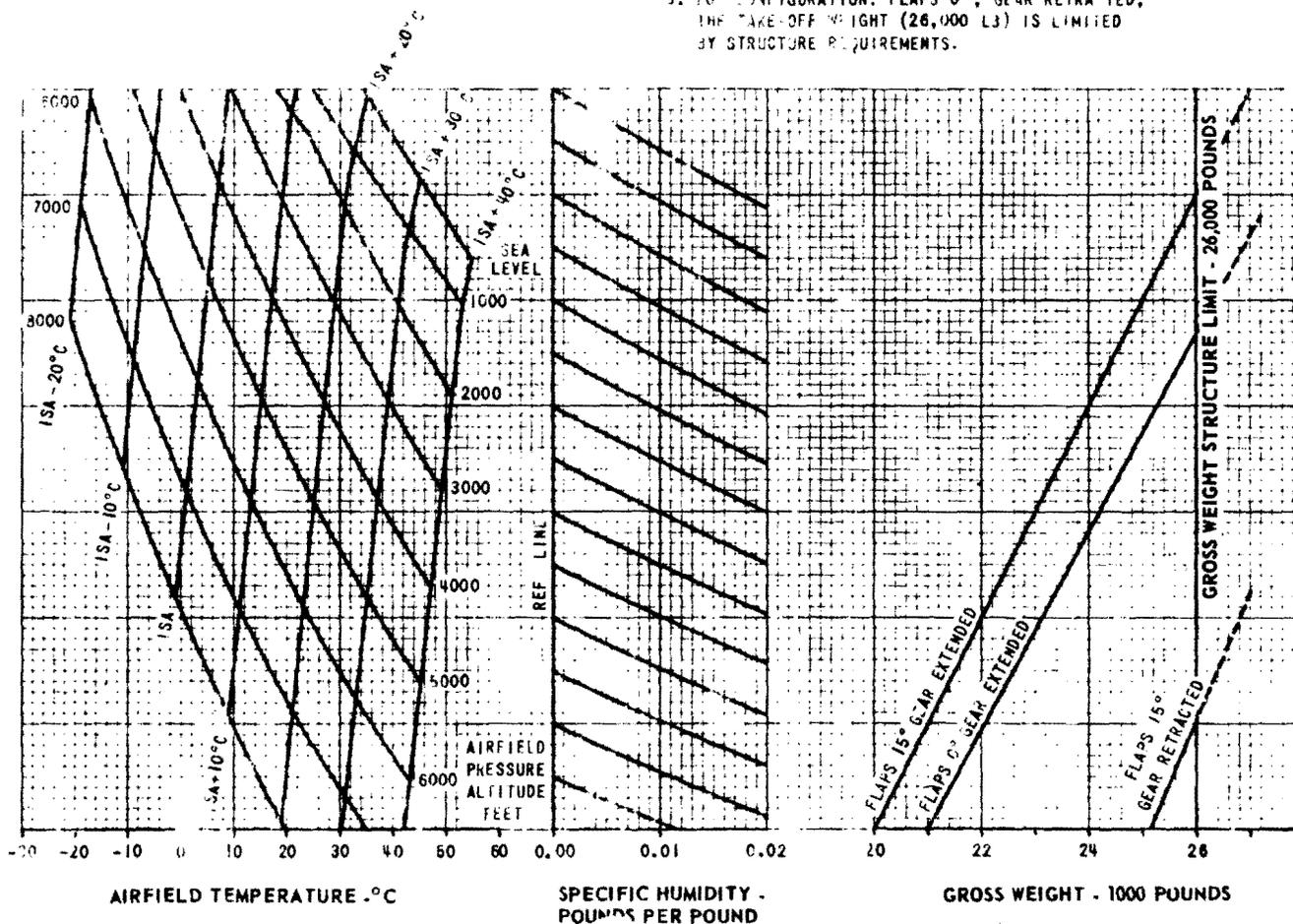
DHC-4 GROSS WEIGHT LIMITATION ONE ENGINE INOPERATIVE

MODEL: C-4
 DATE: SEPTEMBER 1961
 DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE (S): (2) R-2000-13
 FUEL GRADE: 100/130
 FUEL DENSITY: 5.0 LB/GAL

REMARKS:
 PROPELLER FEATHERED
 OTHER ENGINE AT TAKE-OFF POWER

- NOTE:
1. LIMIT BASED ON A V_{LO} OF 100 FPM FOLLOWING A V_{LO} TAKE-OFF.
 2. RECOMMENDED V_{LO} FEED:
 - WITH V_{LO} 75 KNOTS IAS
 - WITH V_{LO} 15° 75 KNOTS IAS
 3. FOR CONFIGURATION: FLAPS 0°, GEAR RETRACTED, THE TAKE-OFF WEIGHT (26,000 L3) IS LIMITED BY STRUCTURE REQUIREMENTS.



DIRECTED STUDY PROGRAM
 DHC - 4

Page: 20
 Ref.: 1080-2

TAKE-OFF AND LANDING CROSSWIND CHART

MODEL: AC-1
 DATE: OCTOBER 1960
 DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE (S): (2) R-2000-712
 FUEL GRADE: 100/130
 FUEL DENSITY: 6.0 LB/GAL

NOTE: WIND SPEEDS REPORTED AT HEIGHT OF 50 FT.

EXAMPLE: (----->)

GIVEN:

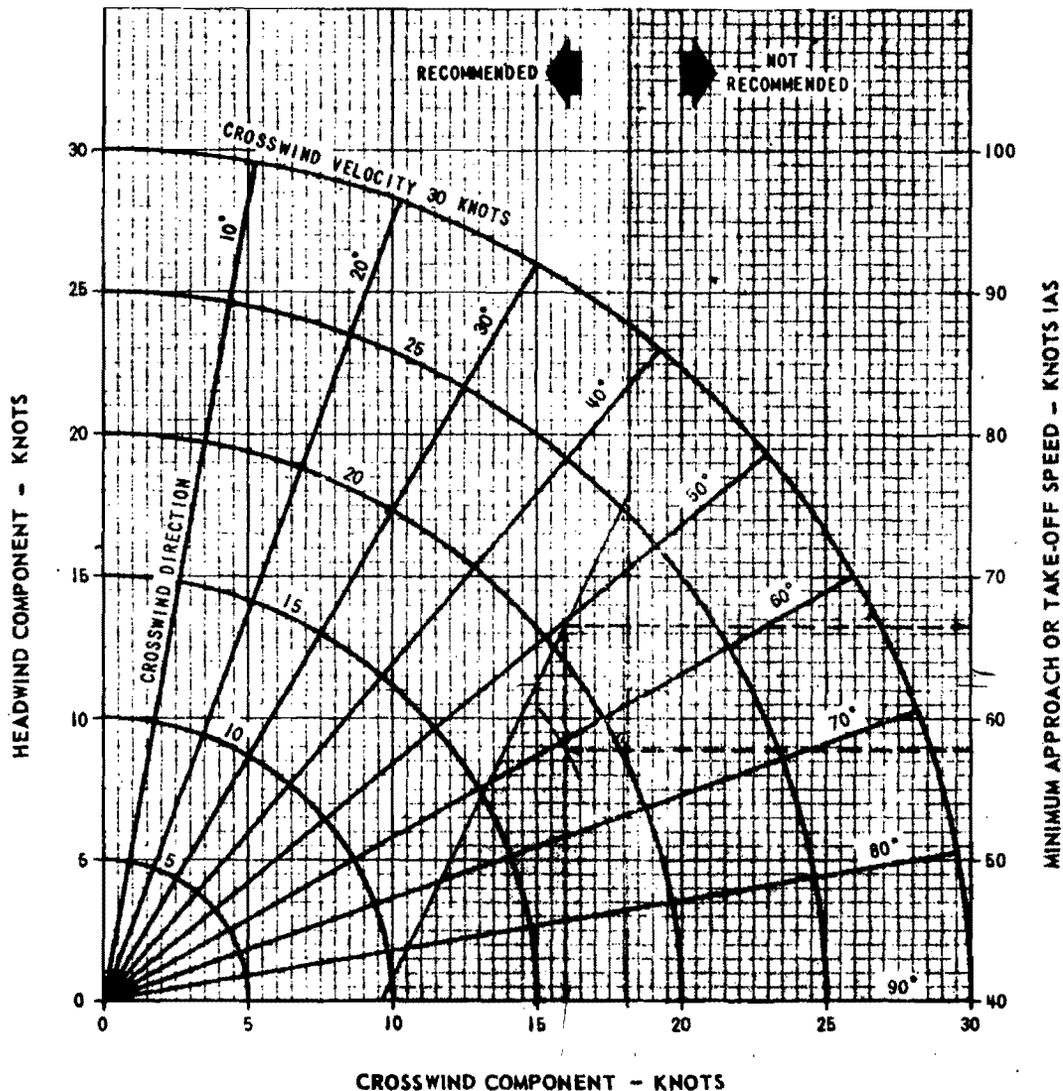
WEIGHT: 23000 LB.
 RUNWAY: 330°
 WIND: 267°/18 KNOTS
 (REPORTED AT 50 FT.)

FIND:

CAN AN APPROACH BE RECOMMENDED AT THE SUGGESTED AIRSPEED OF 58.0 KNOTS IAS.

SOLUTION:

1. RUNWAY WIND ANGLE
 $= 330^\circ - 267^\circ = 63^\circ$
2. AT WIND VELOCITY OF 18 KNOTS AT 63° FIND CROSSWIND COMPONENT OF 16 KNOTS.
3. FIND APPROACH AT 58.0 KNOTS IAS WITH 16 KNOT CROSSWIND COMPONENT NOT RECOMMENDED.
4. PROCEED VERTICALLY AT 16 KNOTS TO BOUNDARY AND FIND MINIMUM RECOMMENDED APPROACH SPEED OF 67.0 KNOTS IAS.



DHC - 4

DIRECTED STUDY PROGRAM

Ref.: 1080-2

Page: 21

TAKE-OFF CURVE

SHORT-FIELD TECHNIQUE (FLAPS 30°)

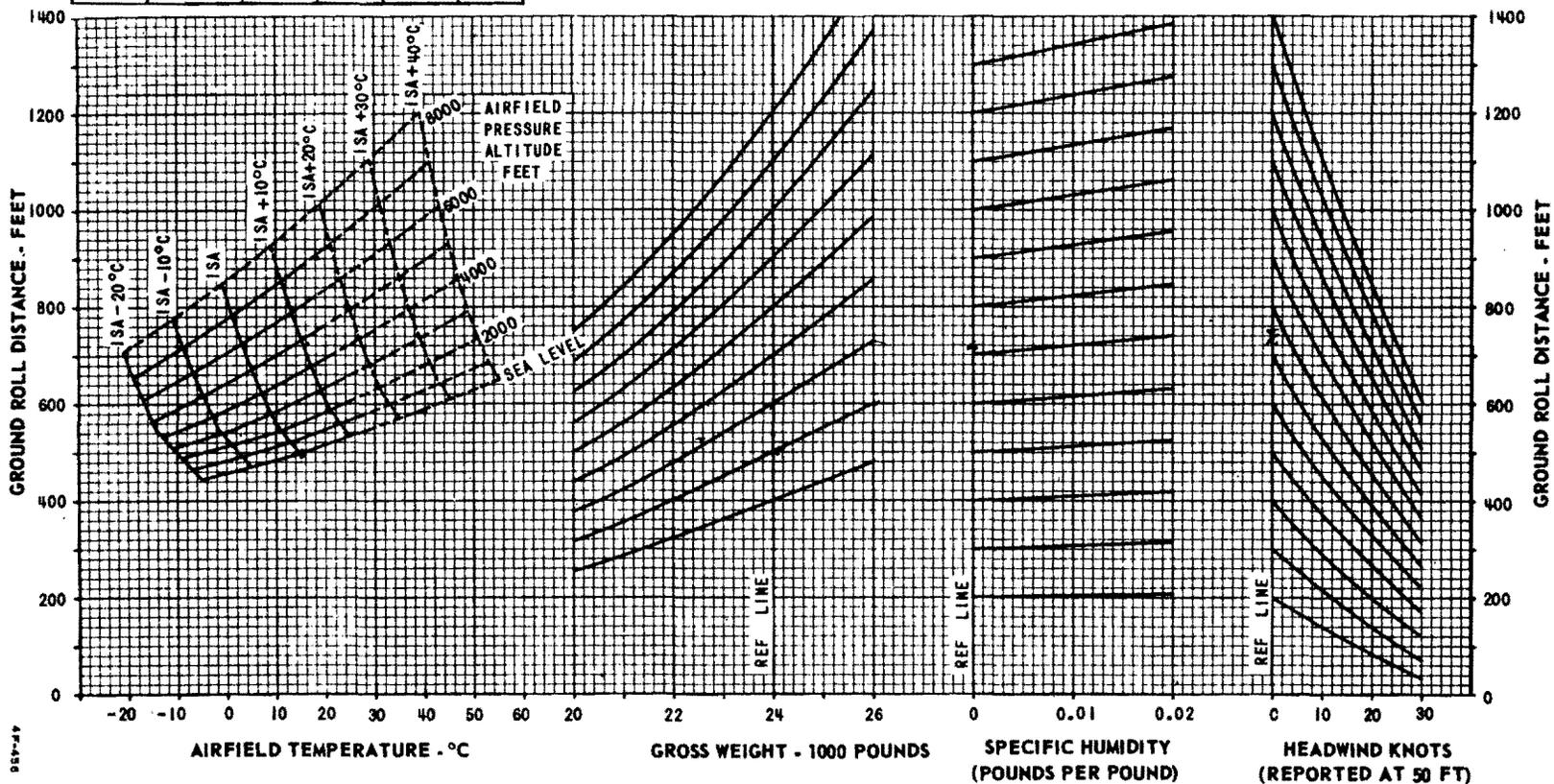
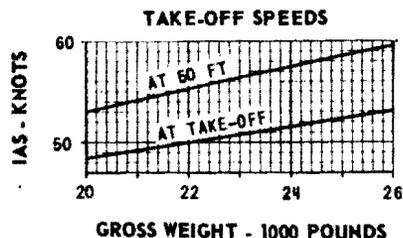
GROUND ROLL

MODEL: CV-2
 DATE: OCTOBER 1960
 DATA BASIS: FLIGHT TEST (AFFTC)

ENGINE (S): (2) R-2000-13
 FUEL GRADE: 100/130
 FUEL DENSITY: 6.0 LB/GAL

NOTE:
 DATA REPRESENTED BY BROKEN
 LINES IS ESTIMATED.
 FOR DISTANCE TO CLEAR 50 FT
 OBSTACLE REFER TO FIGURE 14-23

STANDARD DAY (ISA): DRY AIR					
GROSS WEIGHT POUNDS	PRESSURE ALTITUDE FEET	ZERO WIND		30 KNOT WIND	
		GROUND ROLL-FT	CLEAR 50FT-FT	GROUND ROLL-FT	CLEAR 50FT-FT
26000	SEA LEVEL	600	1110	220	430
	5000	820	1500	330	630
23000	SEA LEVEL	450	840	145	290
	5000	600	1110	220	430



DHC - 4

DIRECTED STUDY PROGRAM

Ref.: 1080-2

Page: 22

DIRECTED STUDY PROGRAM

Page: 23

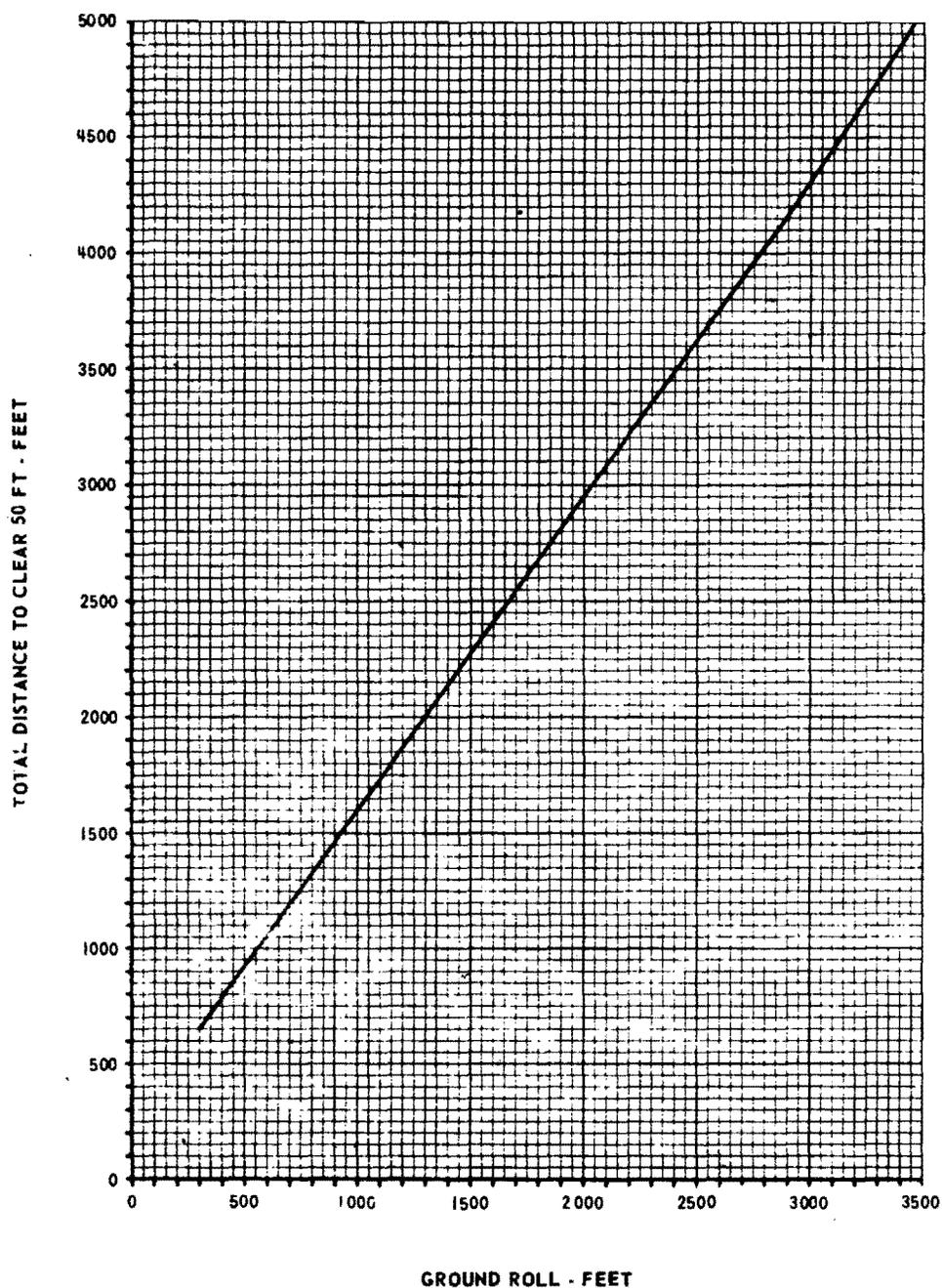
DHC - 4

Ref.: 1080-2

TAKE-OFF CURVE TOTAL DISTANCE TO CLEAR 50 FEET VERSUS GROUND ROLL NORMAL TECHNIQUE (FLAPS 7°)

MODEL: CV-2
DATE: MAY 1961
DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL



ACCELERATE-STOP DISTANCE (FLAPS 15°)

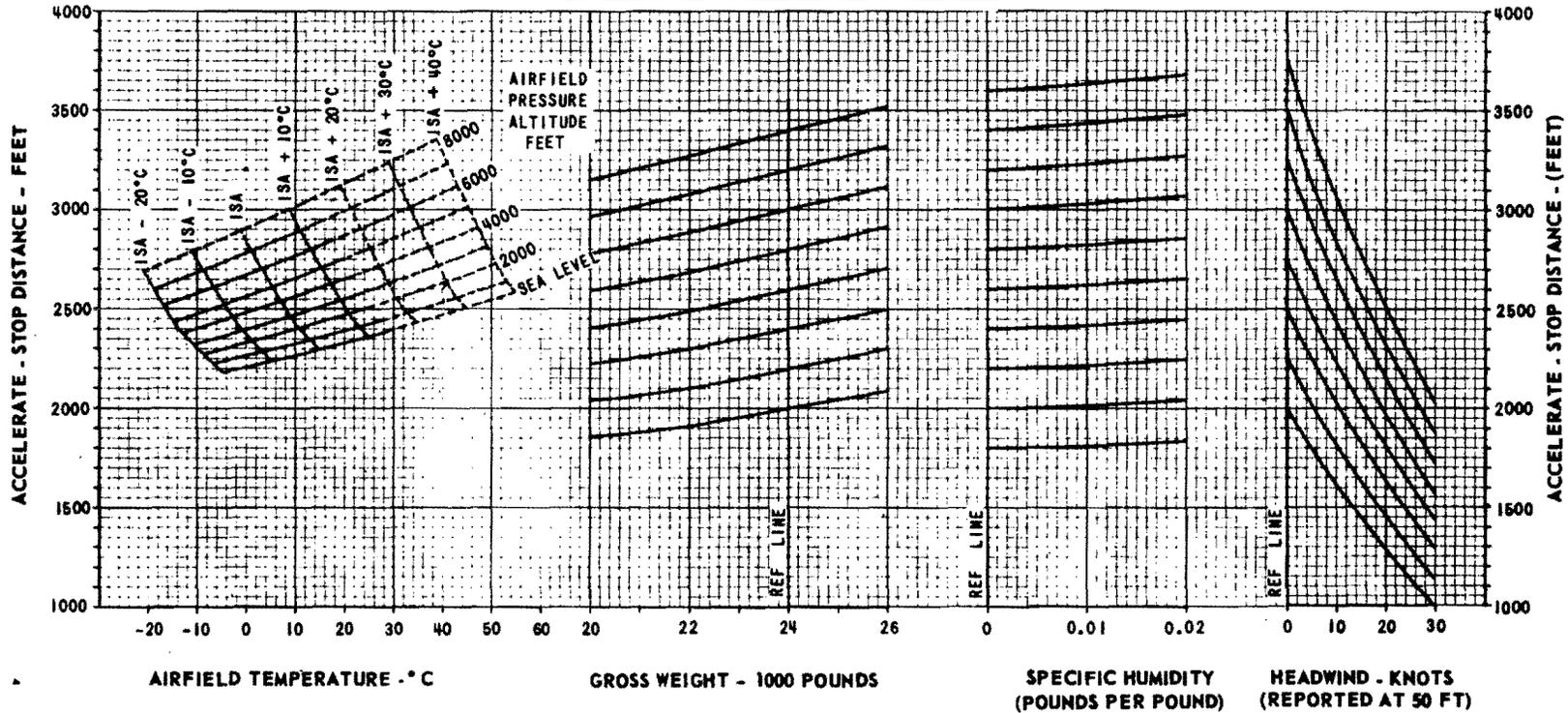
MODEL: CV-2
DATE: OCTOBER 1960
DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

STANDARD DAY (ISA) ; DRY AIR			
GROSS WEIGHT POUNDS	PRESSURE ALTITUDE FEET	DISTANCE - FEET	
		ZERO WIND	30 KNOT WIND
26,000	SEA LEVEL	2400	2190
	5000	2720	2450
23,000	SEA LEVEL	2250	2070
	5000	2560	2320

NOTE:

1. ENGINE FAILURE AT TAKE-OFF SPEED FOR ALL WEIGHTS AND ALTITUDES (69 KNOTS IAS.)
2. DATA REPRESENTED BY BROKEN LINES IS ESTIMATED.



DHC - 4

DIRECTED STUDY PROGRAM

Ref.: 1080-2

Page: 24

DIRECTED STUDY PROGRAM

Page: 25

DHC - 4

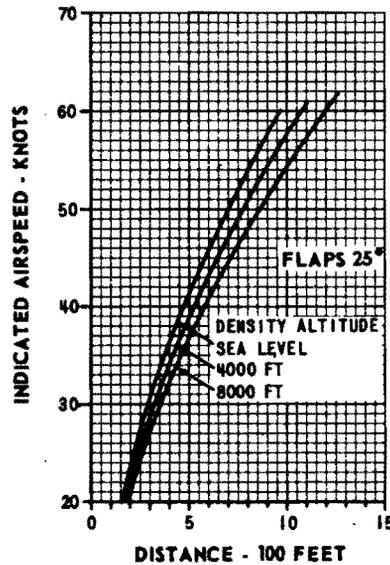
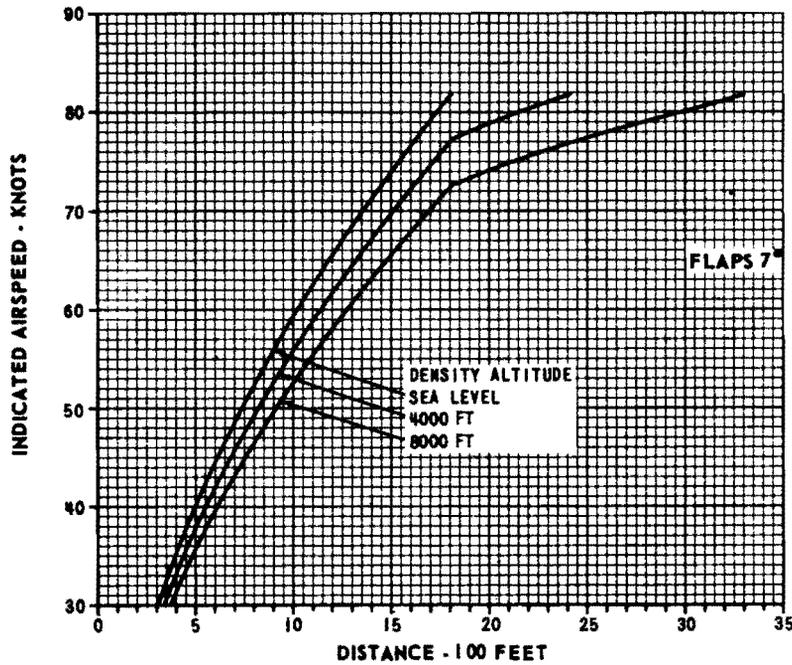
Ref.: 1080-2

STOPPING DISTANCE ABORTED TAKE-OFF

MODEL: CV-2
DATE: MAY 1961
DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

NOTE:
ALL AIRCRAFT WEIGHTS
DRY CONCRETE



CLIMB-OUT CURVE

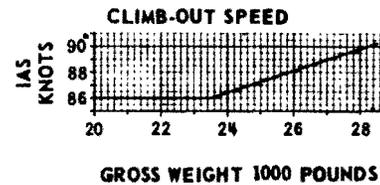
HORIZONTAL DISTANCE TRAVERSED FROM 50 FEET TO FIVE-MINUTE POINT NORMAL TECHNIQUE (FLAPS 7°)

MODEL: CV-2
DATE: MAY 1961
DATA BASIS: FLIGHT TEST
(CONTRACTOR)

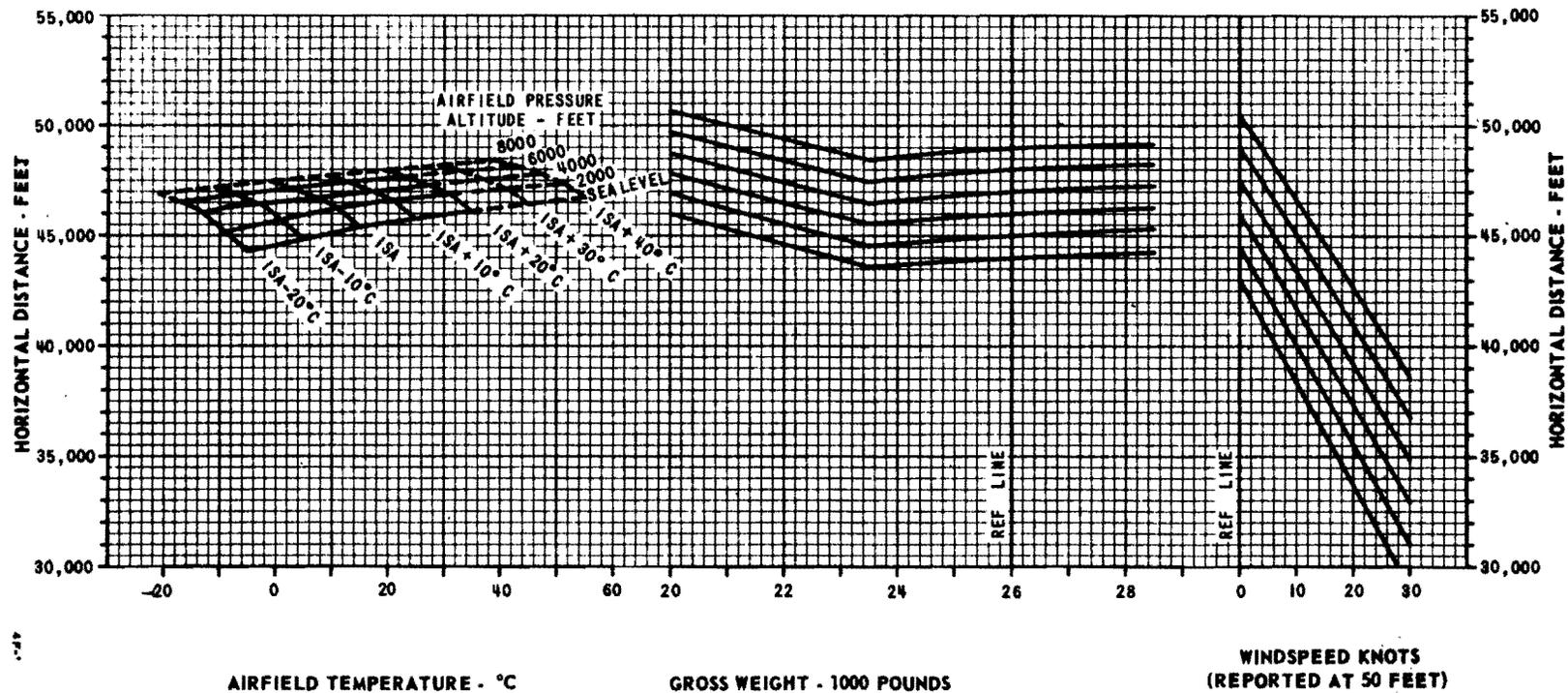
ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

STANDARD DAY (ISA)			
GROSS WEIGHT POUNDS	PRESSURE ALTITUDE FEET	HORIZONTAL DISTANCE - FT	
		ZERO WIND	30 KNOT WIND
28,500	SEA LEVEL	45,700	32,600
	5000	47,100	34,500
26,000	SEA LEVEL	45,400	32,200
	5000	46,900	34,200
23,000	SEA LEVEL	45,200	31,800
	5000	46,700	33,900

NOTE:
DATA REPRESENTED BY BROKEN LINES IS ESTIMATED



REMARKS:
LANDING GEAR RETRACTED



DIRECTED STUDY PROGRAM

DHC - 4

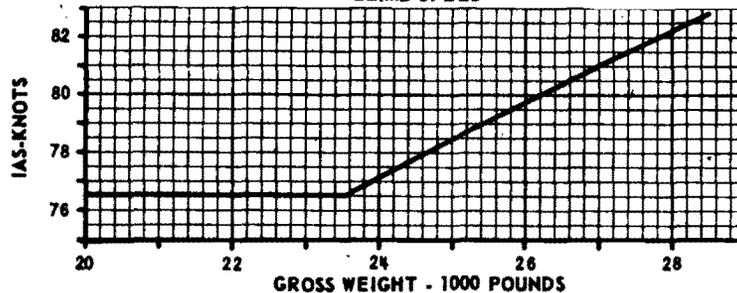
Ref.: 1080-2

Page: 26

EMERGENCY CLIMB-OUT CURVE HEIGHT GAINED DURING LANDING GEAR RETRACTION (FLAPS 7°)

MODEL CY-2
DATE: MAY 1961
DATA BASIS: FLIGHT TEST (CONTRACTOR)
CLIMB SPEED

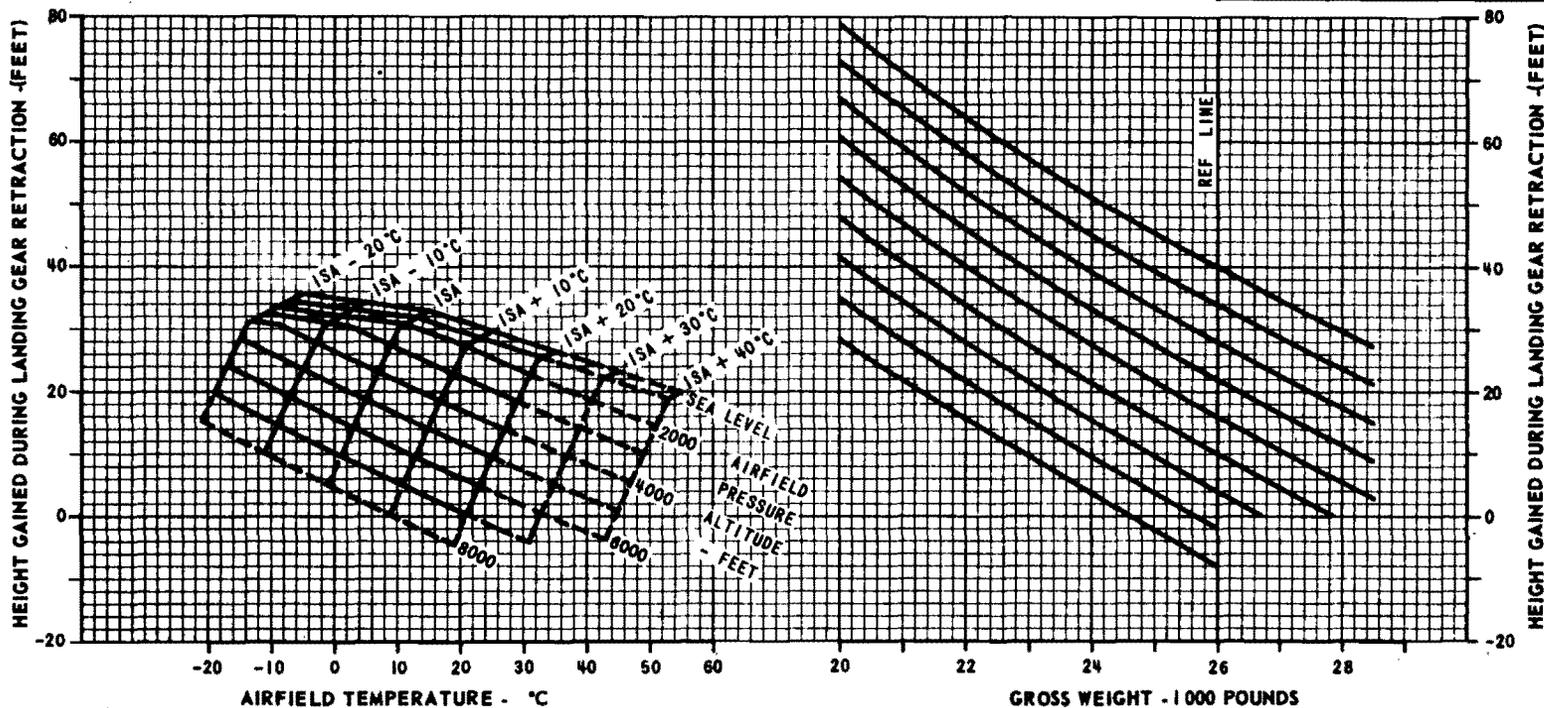
ENGINE(S): (2) R-2600-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL



REMARKS:
ONE ENGINE INOPERATIVE
PROPELLER FEATHERED
OTHER ENGINE AT TAKE-OFF
POWER

NOTE:
DATA REPRESENTED BY
BROKEN LINES IS
ESTIMATED

STANDARD DAY (ISA)		
GROSS WEIGHT POUNDS	PRESSURE ALTITUDE FEET	HEIGHT GAINED
28,500	SEA LEVEL 5000	20 FT 6 FT
26,000	SEA LEVEL 5000	33 FT 19 FT
23,000	SEA LEVEL 5000	50 FT 37 FT



DIRECTED STUDY PROGRAM

Page: 28

DHC - 4

Ref.: 1080-2

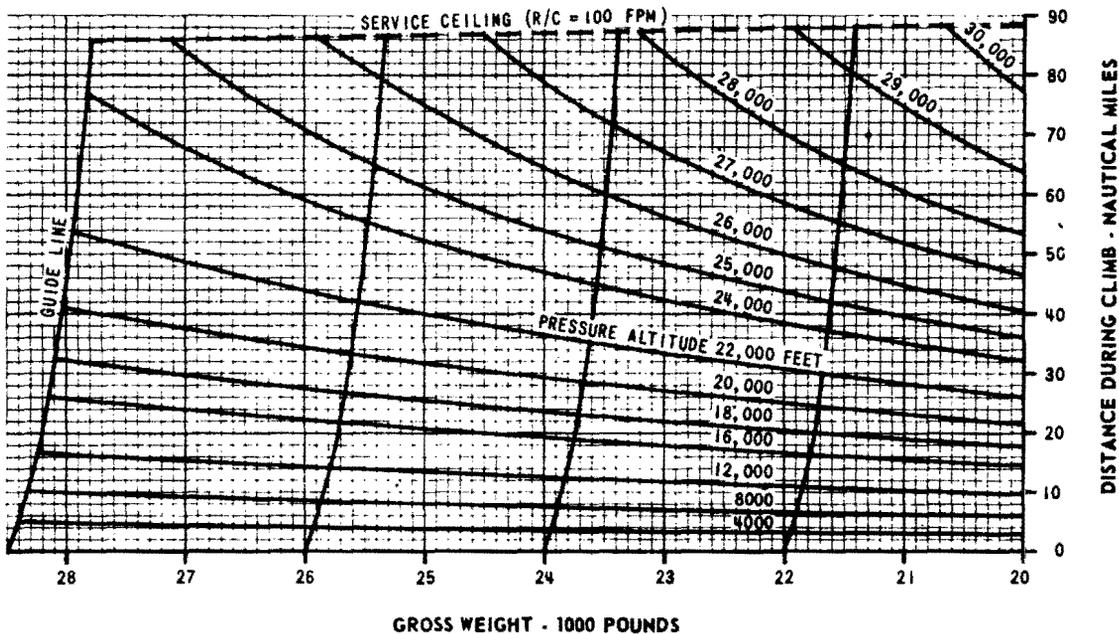
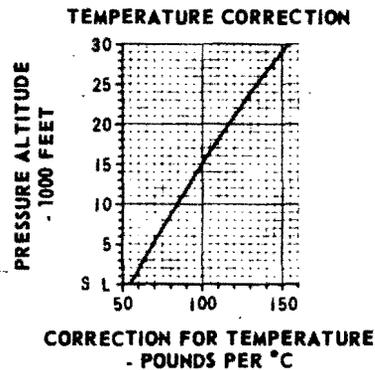
CLIMB CURVE - DISTANCE AND FUEL BOTH ENGINES METO POWER

MODEL: CV-2
DATE: MAY 1961
DATA BASIS: FLIGHT TEST (AFFTC)

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

REMARKS:
STANDARD DAY
FLAPS - EN ROUTE (0°)
LANDING GEAR - RETRACTED
CLIMB SPEED - 96 KNOTS IAS
FOR ALL WEIGHTS AND ALTITUDES

NOTE:
FOR EACH 1°C ABOVE STANDARD O.A.T.
ADD TO ACTUAL AIRCRAFT GROSS
WEIGHT THE AMOUNT SHOWN IN THE
TEMPERATURE CORRECTION CHART TO
OBTAIN AN EQUIVALENT WEIGHT FOR
CLIMB DETERMINATION



PRESSURE ALTITUDE FEET	GROSS WEIGHT AT SEA LEVEL - POUNDS					
	28,500		26,000		23,000	
	DISTANCE NAUTICAL MILES	FUEL USED POUNDS	DISTANCE NAUTICAL MILES	FUEL USED POUNDS	DISTANCE NAUTICAL MILES	FUEL USED POUNDS
SEA LEVEL	0	0	0	0	0	0
5000	6.5	100	5	90	4	70
10,000	13.5	210	11	180	9	140
15,000	24	330	20	280	16	220

EMERGENCY CLIMB ONE ENGINE INOPERATIVE

MODEL: CV-2
DATE: MAY 1961

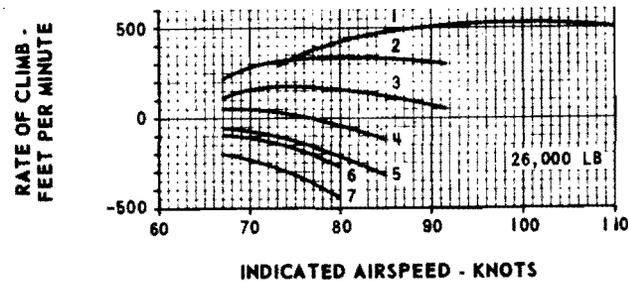
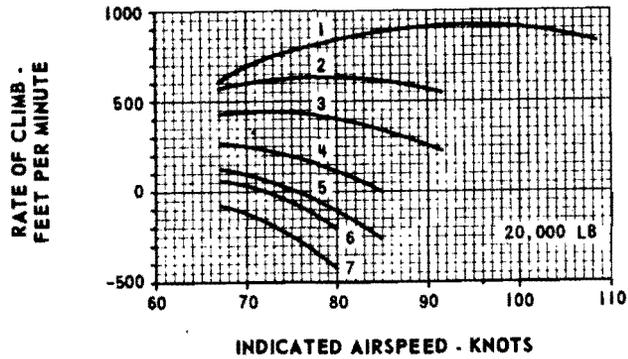
DATA BASIS: FLIGHT TEST (CONTRACTOR) FLAPS 0° AND 15°
ESTIMATED FLAPS 30° AND 40°

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

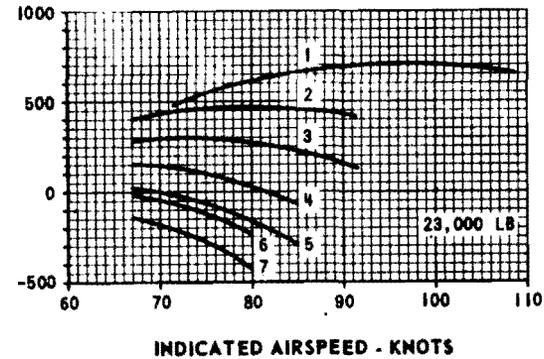
CURVE IDENTIFICATION:

1. FLAPS 0° - GEAR UP
2. FLAPS 15° - GEAR UP
3. FLAPS 15° - GEAR DOWN
4. FLAPS 30° - GEAR UP
5. FLAPS 30° - GEAR DOWN
6. FLAPS 40° - GEAR UP
7. FLAPS 40° - GEAR DOWN

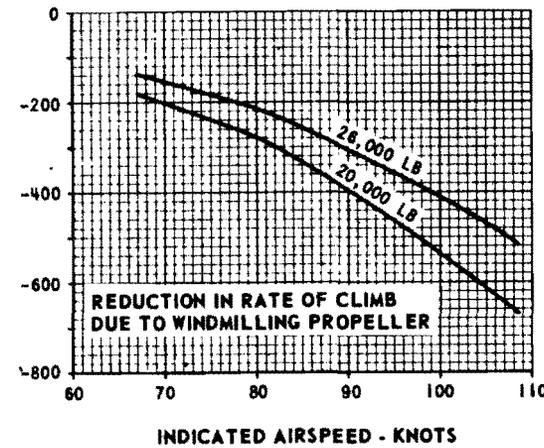
REMARKS:
OPERATIVE ENGINE AT TAKE-OFF POWER,
UNLESS OTHERWISE STATED THE INOPERATIVE
PROPELLER IS FEATHERED.
SEA LEVEL.
STANDARD DAY.



RATE OF CLIMB -
FEET PER MINUTE



REDUCTION IN RATE OF CLIMB -
FEET PER MINUTE



DIRECTED STUDY PROGRAM

DHC - 4

Page: 29

Ref.: 1080-2

DIRECTED STUDY PROGRAM

Page: 30

DHC - 4

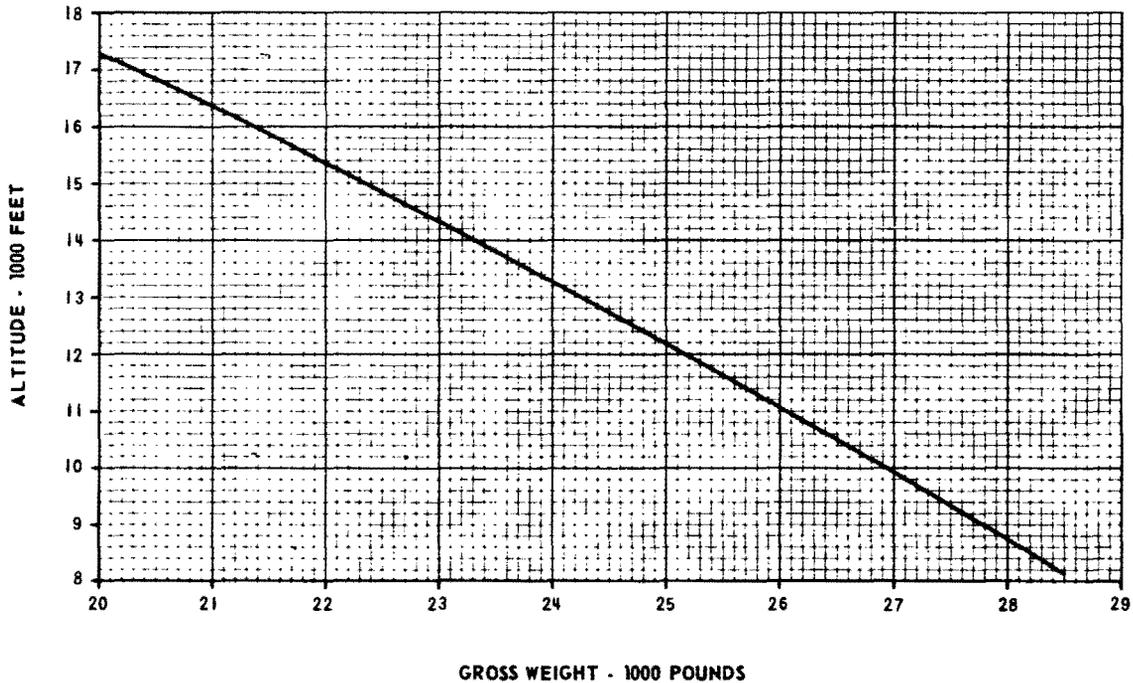
Ref.: 1080-2

EMERGENCY CEILING ONE ENGINE INOPERATIVE - PROPELLER FEATHERED RATE OF CLIMB - 100 FPM

MODEL: CV-2
DATE: MAY 1961
DATA BASIS: FLIGHT TEST (AFFTC)

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

REMARKS:
STANDARD DAY
NETO POWER
FLAPS AND GEAR RETRACTED



DIRECTED STUDY PROGRAM

Page: 31

DHC - 4

Ref.: 1080-2

NAUTICAL MILES PER POUND OF FUEL BOTH ENGINES OPERATING ALTITUDE-5000 FEET

MODEL: CV-2
DATE: OCTOBER 1960
DATA BASIS: FLIGHT TEST (AFFTC)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

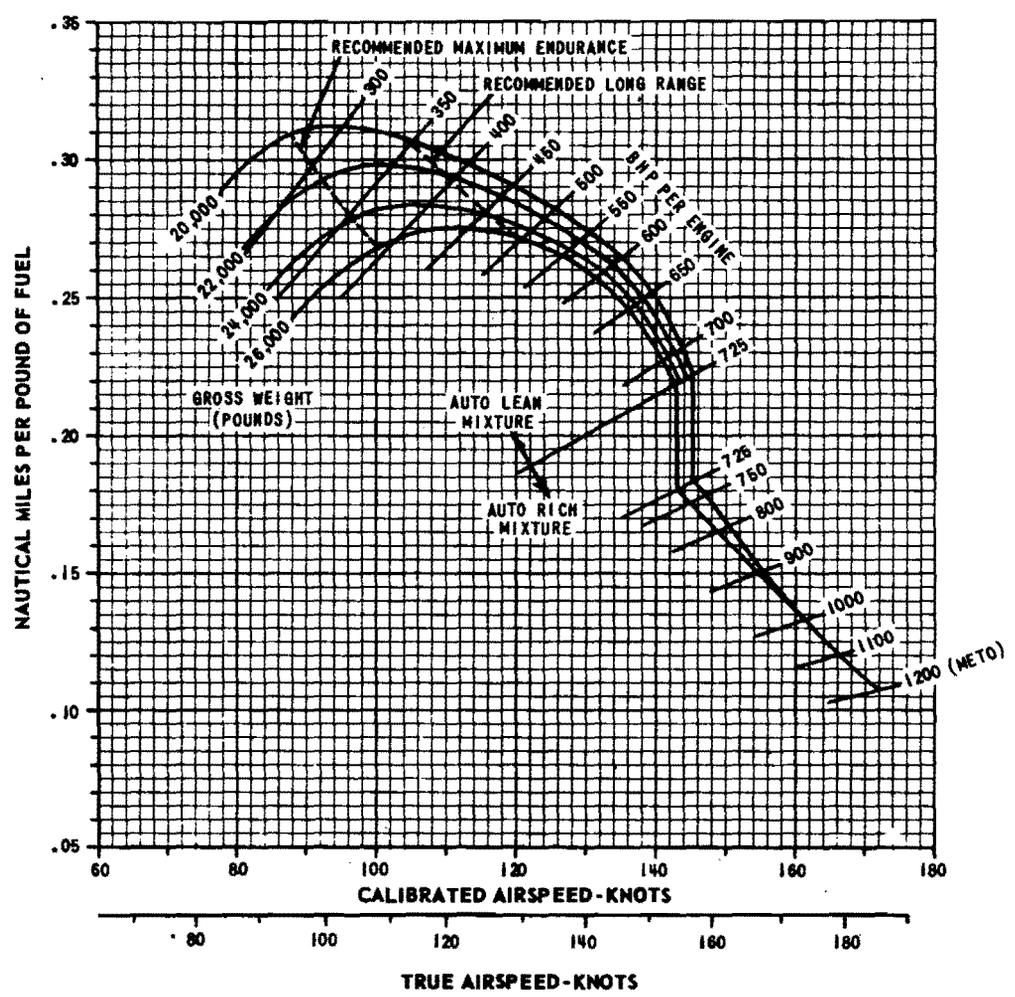
REMARKS:
STANDARD DAY, NO WIND
FLAPS AND GEAR RETRACTED

BHP	MIX.	RPM	M P		BHP	MIX.	RPM	M P	F C
300	A L	1800	19.0	165	725	A L	2000	32.0	357
350	A L	1800	21.0	186	725	A R	2000	30.6	425
400	A L	1800	23.0	205	750	A R	2000	31.3	444
450	A L	1800	25.0	222	800	A R	2000	33.2	482
500	A L	1800	26.8	237	900	A R	2200	34.6	563
550	A L	1800	28.7	251	1000	A R	2200	38.0	649
600	A L	1800	30.6	270	1100	A R	2550	38.0	745
650	A L	1900	31.2	297	1200		2550	41.8	854
700	A L	2000	31.3	333					

NOTE:
WIND CORRECTION TO NAUTICAL MILES/POUND

$$\text{GROUND N. MI/LB} = \text{AIR N. MI/LB} \times \frac{V_{\text{Ground}}}{V_{\text{Air}}}$$
 WHERE: V_{Air} = AIRCRAFT TRUE AIRSPEED
 V_{Ground} = GROUND SPEED

M P MANIFOLD PRESSURE - IN. HG
 F C FUEL CONSUMPTION PER ENGINE - LB/HR
 A L AUTO LEAN
 A R AUTO RICH



DIRECTED STUDY PROGRAM

Page: 32

DHC - 4

Ref.: 1080-2

NAUTICAL MILES PER POUND OF FUEL ONE ENGINE INOPERATIVE - PROPELLER FEATHERED ALTITUDE-5000 FEET

MODEL: CV-2
DATE: OCTOBER 1960
DATA BASIS: FLIGHT TEST (AFFTC)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

REMARKS:
STANDARD DAY, NO WIND
FLAPS AND GEAR RETRACTED

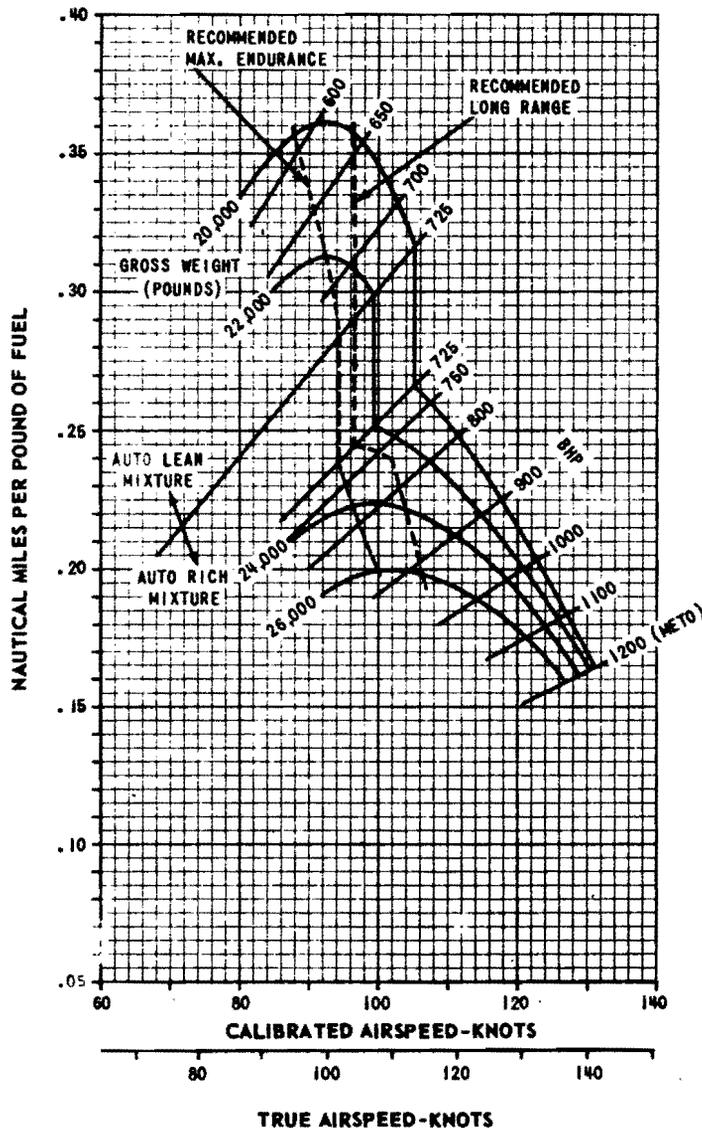
NOTE:
WIND CORRECTION TO NAUTICAL MILES/POUND

$$\text{GROUND N. MI/LB} = \text{AIR N. MI/LB} \times \frac{V_{\text{Ground}}}{V_{\text{Air}}}$$

WHERE: V_{Air} = AIRCRAFT TRUE AIRSPEED
 V_{Ground} = GROUND SPEED

BHP	MIX.	RPM	M P	F C	BHP	MIX.	RPM	M P	F C
600	A L	1800	30.6	270	800	A R	2000	33.2	482
650	A L	1900	31.2	297	900	A R	2200	34.6	563
700	A L	2000	31.3	333	1000	A R	2200	38.0	649
725	A L	2000	32.0	357	1100	A R	2550	38.0	745
725	A R	2000	30.6	425	1200	A R	2550	41.8	854
750	A R	2000	31.3	444					

M P MANIFOLD PRESSURE - IN. HG
F C FUEL CONSUMPTION OPERATING ENGINE - LB/HR
A L AUTO LEAN
A R AUTO RICH



DIRECTED STUDY PROGRAM

Page: 33

DHC - 4

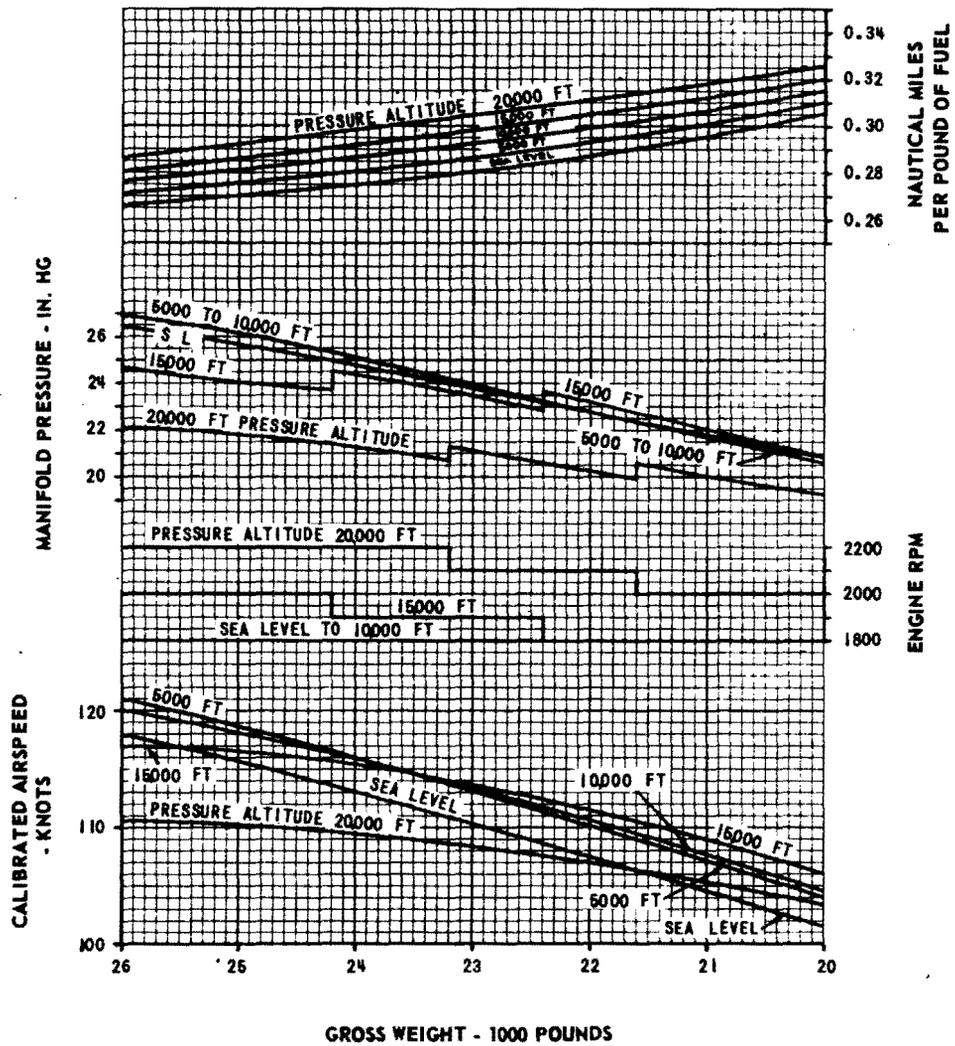
Ref.: 1080-2

LONG RANGE SUMMARY BOTH ENGINES OPERATING

MODEL: CV-2
DATE: OCTOBER 1940
DATA BASIS: FLIGHT TEST (AFFTC)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

REMARKS:
STANDARD DAY
FLAPS AND GEAR RETRACTED
AUTO LEAN MIXTURE



WEIGHT	26000 LB					23000 LB				
	NAUTICAL MILES PER POUND	MIX.	R P M	M P IN. HG	C A S KNOTS	NAUTICAL MILES PER POUND	MIX.	R P M	M P IN. HG	C A S KNOTS
SEA LEVEL	0.266	A L	1800	26.4	118.0	0.280	A L	1800	23.8	110.3
5000	0.271	A L	1800	26.9	121.0	0.287	A L	1800	23.9	113.0
10000	0.276	A L	1800	26.9	120.0	0.293	A L	1800	23.9	113.4

DIRECTED STUDY PROGRAM

Page: 34

DHC - 4

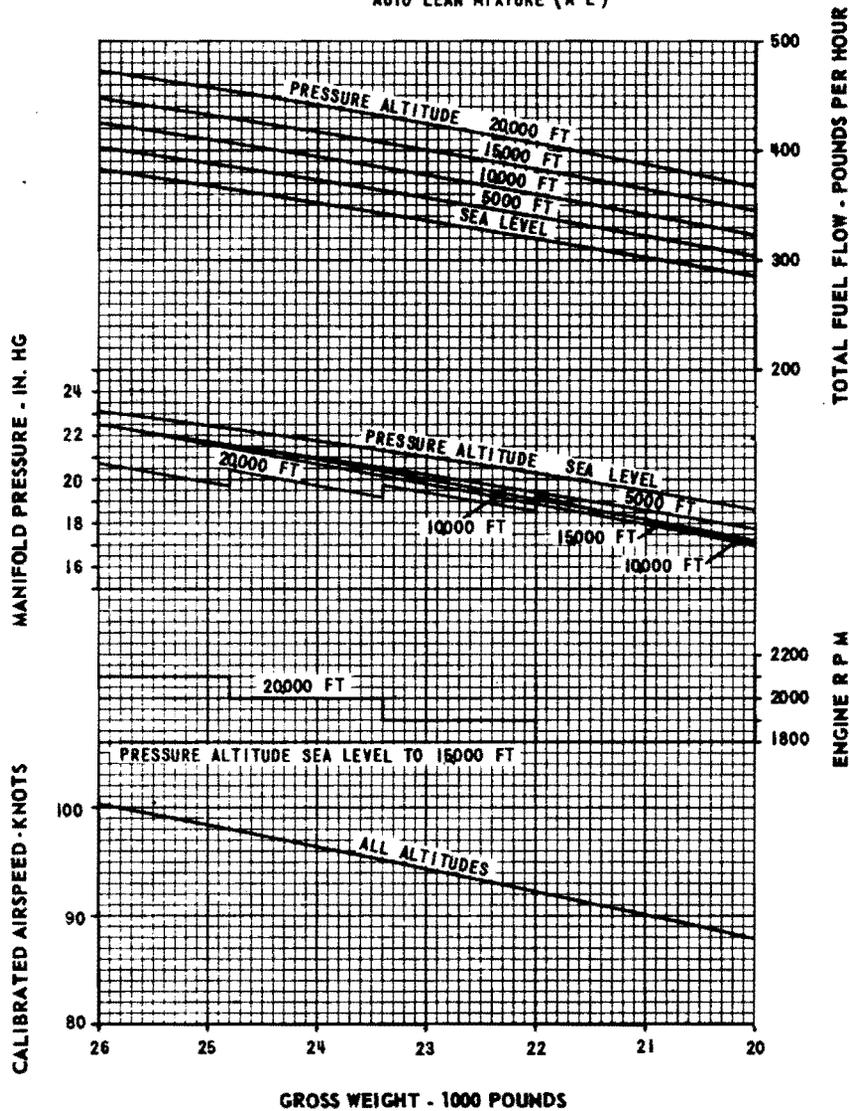
Ref.: 1080-2

MAXIMUM ENDURANCE BOTH ENGINES OPERATING

MODEL: CV-2
DATE: OCTOBER 1960
DATA BASIS: FLIGHT TEST (AFFTC)

REMARKS:
STANDARD DAY
FLAPS AND GEAR RETRACTED
AUTO LEAN MIXTURE (A L)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL



WEIGHT	26000 LB					23000 LB				
	LB PER HOUR	MIX.	R P M	M P IN. HG	C A S KNOTS	LB PER HOUR	MIX.	R P M	M P IN. HG	C A S KNOTS
SEA LEVEL	382	A L	1800	23.1	100.3	336	A L	1800	21.0	94.4
5000	402	A L	1800	22.6	100.3	367	A L	1800	20.2	94.4
10000	425	A L	1800	22.6	100.3	377	A L	1800	20.0	94.4

DIRECTED STUDY PROGRAM

Page: 35

DHC - 4

Ref.: 1080-2

LONG RANGE PREDICTION - DISTANCE BOTH ENGINES OPERATING

MODEL CV-2
DATE: OCTOBER 1960
DATA BASIS: FLIGHT TEST (AFFTC)

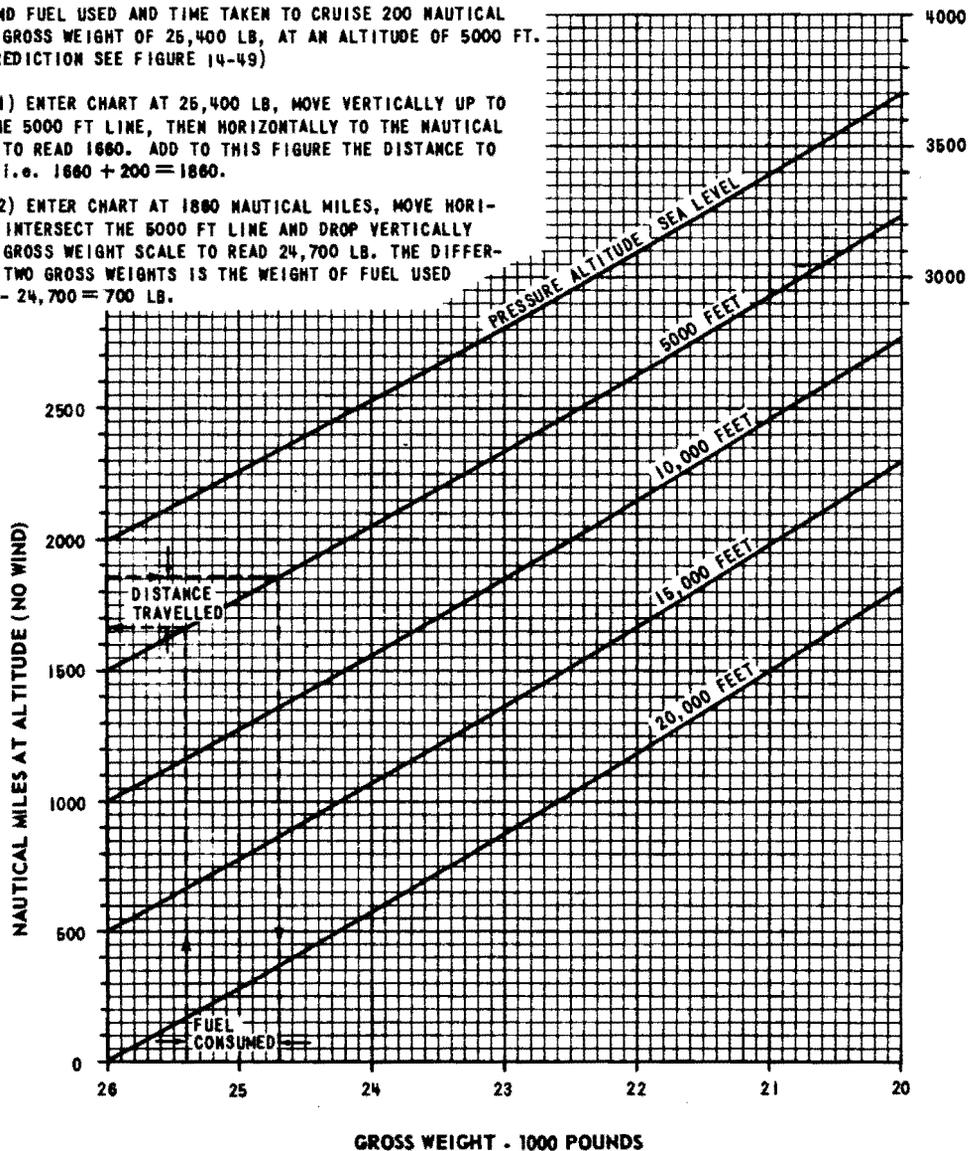
ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

REMARKS:
STANDARD DAY
FLAPS AND GEAR RETRACTED
BASED ON RECOMMENDED
LONG RANGE CRUISING SPEED

EXAMPLE: FIND FUEL USED AND TIME TAKEN TO CRUISE 200 NAUTICAL MILES, AT A GROSS WEIGHT OF 26,400 LB, AT AN ALTITUDE OF 5000 FT. (FOR TIME PREDICTION SEE FIGURE 14-49)

SOLUTION: (1) ENTER CHART AT 26,400 LB, MOVE VERTICALLY UP TO INTERSECT THE 5000 FT LINE, THEN HORIZONTALLY TO THE NAUTICAL MILES SCALE TO READ 1860. ADD TO THIS FIGURE THE DISTANCE TO BE COVERED, i.e. $1860 + 200 = 1860$.

(2) ENTER CHART AT 1860 NAUTICAL MILES, MOVE HORIZONTALLY TO INTERSECT THE 5000 FT LINE AND DROP VERTICALLY DOWN TO THE GROSS WEIGHT SCALE TO READ 24,700 LB. THE DIFFERENCE IN THE TWO GROSS WEIGHTS IS THE WEIGHT OF FUEL USED i.e. $26,400 - 24,700 = 700$ LB.



DIRECTED STUDY PROGRAM

Page: 36

DHC - 4

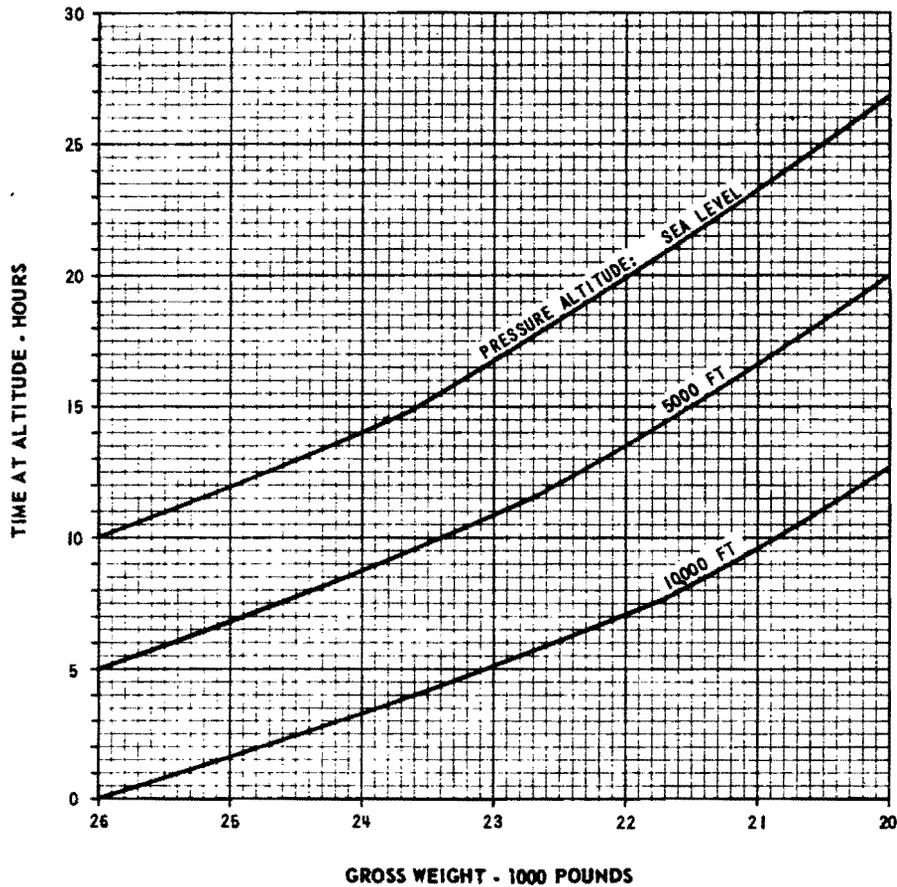
Ref.: 1080-2

LONG RANGE PREDICTION - TIME ONE ENGINE INOPERATIVE - PROPELLER FEATHERED

MODEL: CV-2
DATE: OCTOBER 1960
DATA BASIS: FLIGHT TEST (AFFTC)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

REMARKS:
STANDARD DAY
FLAPS AND GEAR RETRACTED
BASED ON RECOMMENDED
LONG RANGE CRUISING SPEED



DIRECTED STUDY PROGRAM

Page: 37

DHC - 4

Ref.: 1080-2

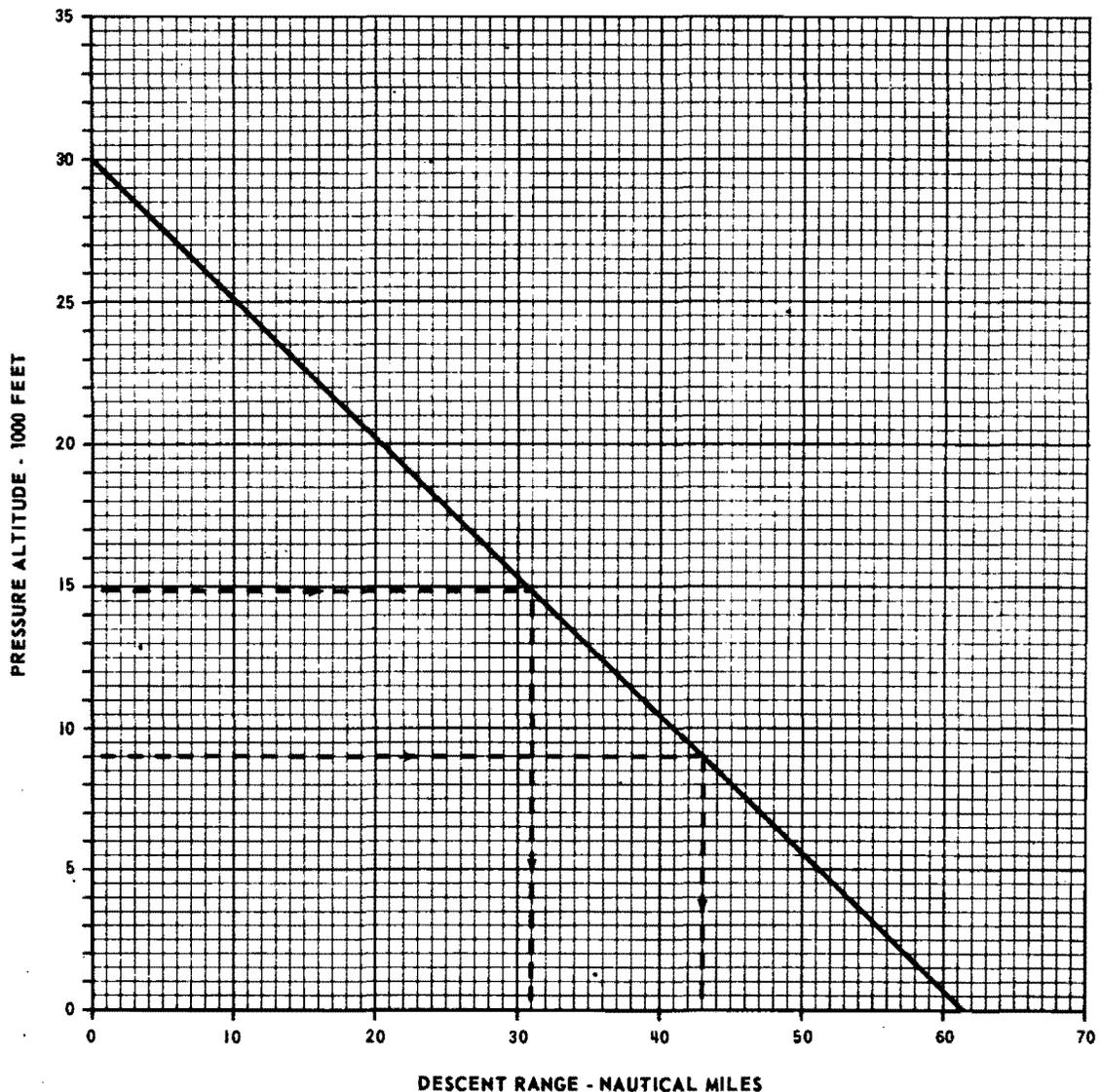
DESCENT RANGE CLEAN CONFIGURATION - BOTH PROPELLERS FEATHERED

MODEL: CV-2
DATE: MAY 1961
DATA BASIS: FLIGHT TEST (AFFTC)

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

EXAMPLE:
FIND DISTANCE FLOWN DURING DESCENT FROM
14,900 FEET TO 9000 FEET.
ENTER CHART AT 14,900 FEET ON VERTICAL
SCALE AND FIND THE CORRESPONDING VALUE OF
31 NAUTICAL MILES ON THE HORIZONTAL SCALE.
REPEAT THE PROCESS AT 9000 FEET AND FIND
CORRESPONDING VALUE OF 43 NAUTICAL MILES.
THE DESCENT RANGE = 43 - 31 = 12 NAUTICAL MILES.

GROSS WEIGHT POUNDS	C A S KNOTS
20,000	90
22,000	94
24,000	98
26,000	102
28,500	107



LANDING DISTANCE

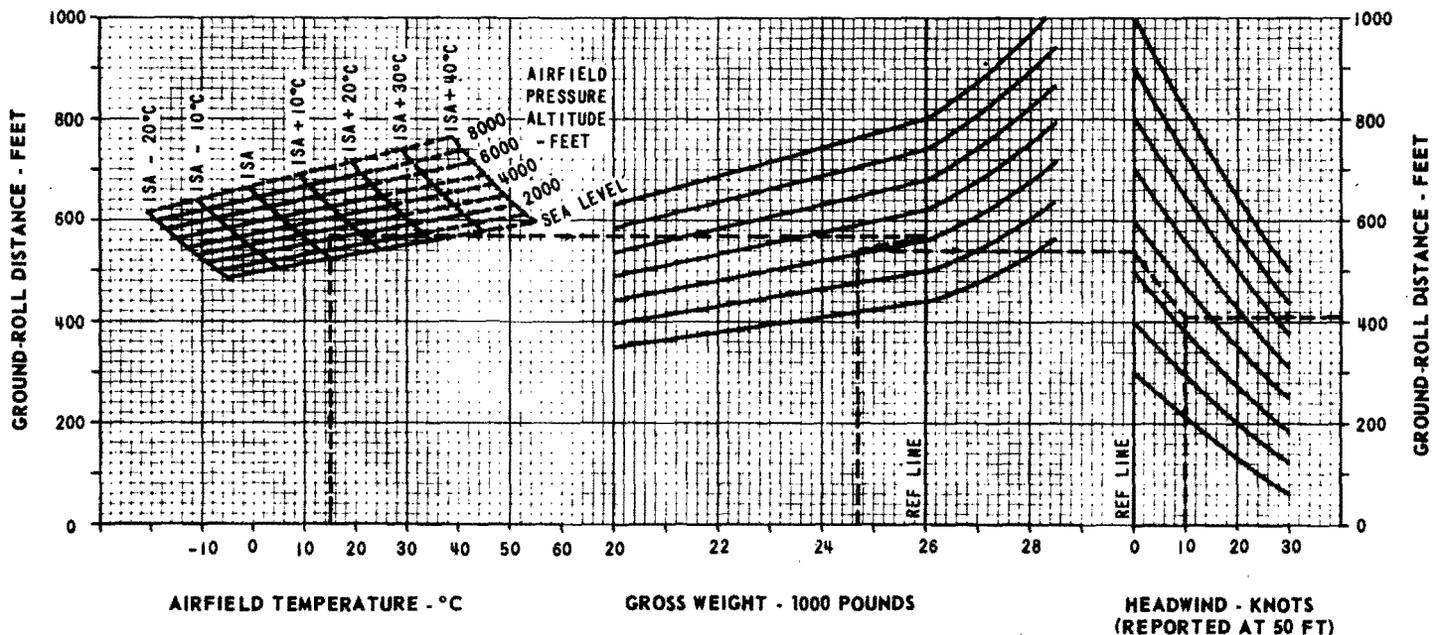
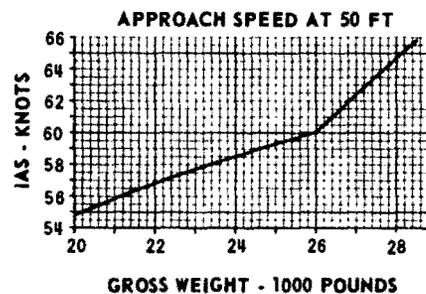
GROUND ROLL. SHORT-FIELD TECHNIQUE (FLAPS 40°)

MODEL: CV-2
 DATE: MAY 1961
 DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE(S): (2) R-2000-13
 FUEL GRADE: 100/130
 FUEL DENSITY: 6.0 LB/GAL

- NOTE:
1. DATA REPRESENTED BY BROKEN LINES IS ESTIMATED
 2. FOR DISTANCE TO CLEAR 50 FT REFER TO FIGURE 14-110

STANDARD DAY (ISA)					
GROSS WEIGHT POUNDS	PRESSURE ALTITUDE FEET	ZERO WIND		30 KNOT WIND	
		GROUND ROLL-FT	CLEAR 50FT-FT	GROUND ROLL-FT	CLEAR 50FT-FT
28,500	SEA LEVEL	685	1245	300	660
	5000	780	1420	370	780
26,000	SEA LEVEL	525	1030	195	470
	5000	605	1160	250	570
23,000	SEA LEVEL	470	950	165	410
	5000	545	1060	210	500



DIRECTED STUDY PROGRAM

DHC - 4

Ref.: 1080-2

Page: 38

DIRECTED STUDY PROGRAM

Page: 39

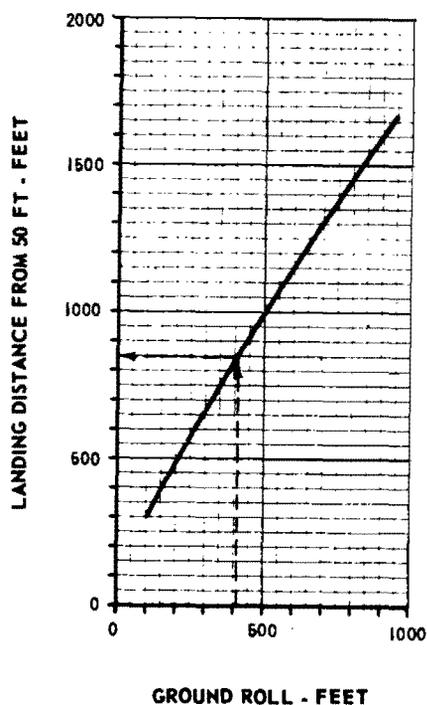
DHC - 4

Ref.: 1080-2

LANDING DISTANCE LANDING DISTANCE FROM 50 FEET VERSUS GROUND ROLL SHORT-FIELD TECHNIQUE (FLAPS 40°)

MODEL: CV-2
DATE: OCTOBER 1960
DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE (S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL



DIRECTED STUDY PROGRAM

DHC - 4

Page: 40

Ref.: 1080-2

STALL SPEED POWER FOR ZERO THRUST CG AT FORWARD LIMIT

MODEL: CV-2
DATE: MAY 1961
DATA BASIS: FLIGHT TEST (CONTRACTOR)

ENGINE(S): (2) R-2000-13
FUEL GRADE: 100/130
FUEL DENSITY: 6.0 LB/GAL

