C.A.A. APPROVED
AIRPLANE FLIGHT MANUAL
DOUGLAS AIRCRAFT CO., INC.

MODEL R4D-8
MANUFACTURER'S SERIAL NO. 43354
C.A.A. IDENTIFICATION NO. N28TN

Approved by Armer M. Alcorn
Date of Approval July 24, 1950

The operating restrictions, normal and emergency operating procedures, performance data, and the loading schedule contained in Sections I through IV conform to Civil Air Regulations and are C.A.A. approved. For a description of airplane systems and their controls, refer to Appendix A, which is not C.A.A. approved.

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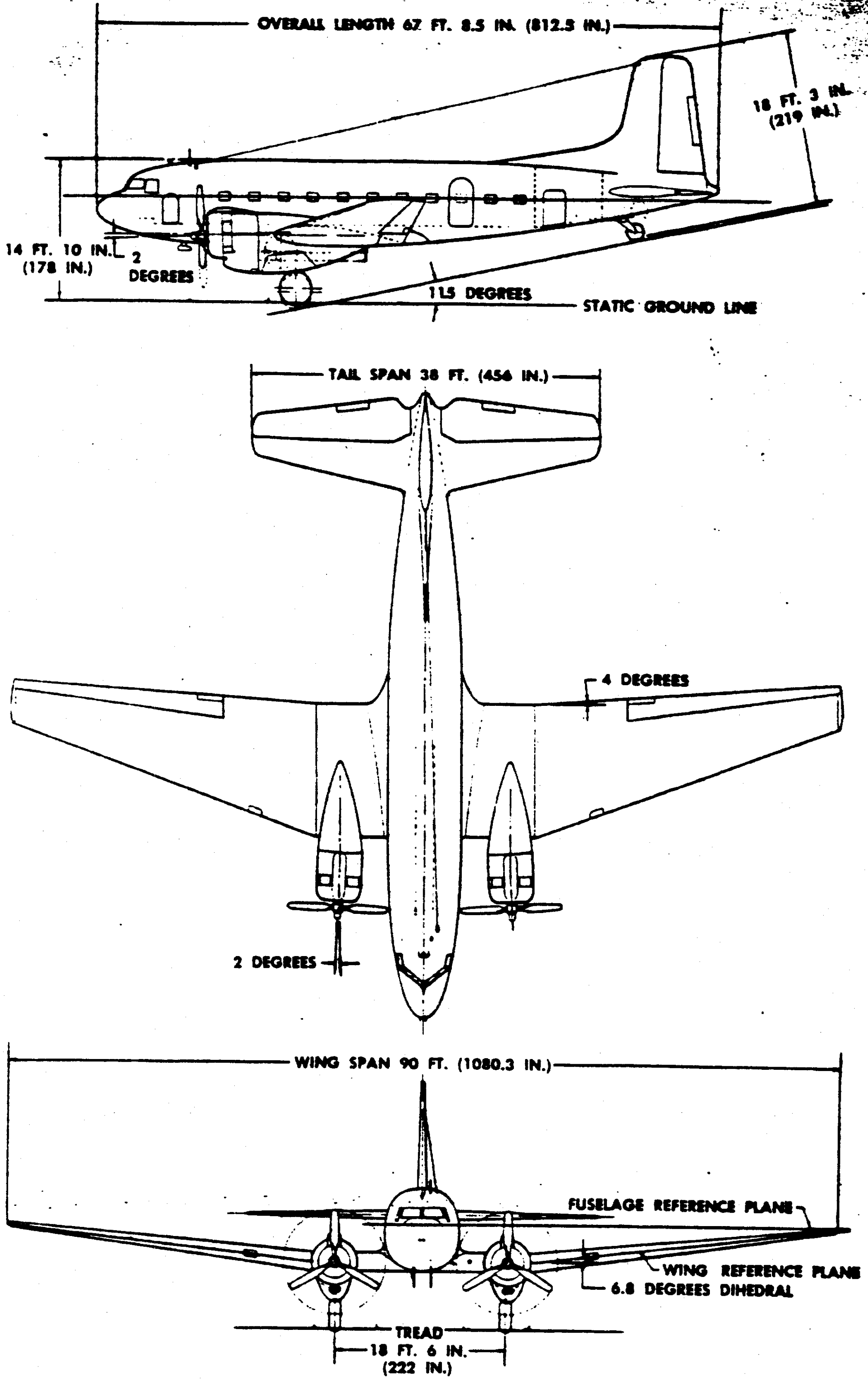

THREE-VIEW OF AIRPLANE

SECTION I

NOTE: Limit R4D-8
Aircraft to 31,000#
Takeoff and 30,000#
Landing wt per T.C.
AGL

OPERATING LIMITATIONS

1.1. WEIGHT LIMITS.

1. Maximum take-off weight at sea level is 31,900 pounds* with automatic feathering. Maximum take-off weight at sea level is 29,325 pounds without automatic feathering.

2. Maximum landing weight at sea level is 30,400 pounds.

NOTE: See Section III for maximum permissible operating weights for various altitudes. In scheduled passenger operations, operating weights are limited in accordance with CAR Part 40.

3. All fuel weight must be distributed equally on both sides of the airplane. All front center wing tanks must be filled equally first, then rear center wing tanks, then outer wing tanks (if installed). Fuel must be used in reverse order from fuel loading except for take-off, climb, and landing at which time the front center wing tanks should be used. Carburetor vent flow returns to front center wing tanks.

NOTE: For gross weights between 31,000 pounds and 31,900 pounds the above fuel schedule should be maintained except that all weight in excess of 31,000 pounds must be in fuel and equally distributed in outer wing tanks.

1.2. CENTER OF GRAVITY LIMITS. -- This airplane is to be operated in accordance with the approved loading schedule. The datum is 39 inches aft of the nose.

1. The maximum forward center of gravity position for landing or take-off is 10 percent M.A.C., gear down position.

2. The maximum aft center of gravity position for operation is 36 percent M.A.C., gear up position, and 37 percent M.A.C., gear down position.

3. The maximum forward center of gravity position for climb or cruise is 7 percent M.A.C., gear up position.

1.3. POWER PLANTS. -- The two-single-row, air-cooled, radial, nine cylinder Wright Cyclone 968C9HE2 engines

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* Weight above 31,000 pounds must be in outer wing fuel.

incorporate 16:9 reduction gearing to drive the 11 foot 6.25 inch Hamilton Standard Hydromatic propellers. Each engine is equipped with a single speed supercharger.

1.3.1. RATINGS.

CONDITION	BHP	RPM	ALTITUDE in FEET	M.P. in H G.
Take-Off (2 minutes)	1475	2800	S.L.	54.5
	1475	2800	1700	54.0
Maximum (except Take-Off)	1275	2500	S.L.	46.5
	1275	2500	3700	45.5

1.3.2. TEMPERATURE.

Max. Permissible Cyl. Head Temp., Take-Off	500°F(260°C)
Max. Permissible Cyl. Head Temp., Max. cont.	475°F(246°C)
Maximum Permissible Oil Inlet Temperature	220°F(104°C)

1.3.3. FUEL. -- Use fuel of grade 100/130.

1.4. PROPELLERS. -- The propellers are three-blade-type, Hamilton Standard Hydromatic propellers, equipped with 23E50 hub and 6615A-0 blade. Pitch settings are as follows:

Low Pitch Setting (Blade Sta. 42)	18°
High Pitch Setting	None
Feathering (Blade Sta. 42)	88° (approx.)

CAUTION

Avoid continuous operation below 1800 rpm.

1.5. SPEEDS.

1.5.1. SPEED LIMITATIONS.

	TIAS (MPH)
1. Maximum never exceed speed (V_{NE})	273
2. Normal operating limit speed (V_{NO}) ...	233
3. Maximum permissible speed for extension of wing flaps (V_{FE})	133

TIAS (MPH)

4. Maximum permissible speed for raising and lowering the landing gear (V_{LO}) 166

5. Maximum permissible speed with landing gear extended (V_{LE}) 166

6. Maneuvering speed (V_A) 144

7. Minimum control speed (V_{MC}) 88

8. Propeller unfeathering 160

1.5.2. AIRSPEED INDICATOR MARKINGS.

Red radial line -- Never exceed speed V_{NE}.

Yellow arc -- Caution range, extending from V_{NO} to V_{NE}.

White arc -- Flaps extended range, extending from stalling speed with flaps in landing position at maximum landing weight to the flaps extended speed (V_{FE}).

Green arc -- Normal operating range, extending from stalling speed with flaps retracted at maximum take-off weight to V_{NO}.

1.6. FLIGHT LOAD ACCELERATION LIMITS:

FLAPS UP

WT. - LBS.	GUST		MANEUVER	
	Pos.	Neg.	Pos.	Neg.
31,000	+2.98	-0.98	+2.50	-1.00
		FLAPS DOWN		
30,000	+1.73	-0.27	+2.00	-0.00

1.7. MINIMUM CREW. -- The airplane may be safely operated with a minimum flight crew of two; a pilot and a copilot, all operations.

1.8. FLAPS. -- The performance shown in Section III of this manual is based upon the following flap settings:

Take-off	0°	(full up)
Approach	11°	(1/4 down)
Landing	45°	(full down)
Enroute operation	0°	(full up)

1.9. TAXIING. -- There are no special limitations on taxiing this airplane, with the exception that no attempt should be made to pivot the airplane with the brakes fully applied to one wheel.

1.10. CRITICAL CROSS-WIND OPERATION, FIXED GEAR. -- The critical cross-wind component for this airplane has been demonstrated to be 20 mph TIAS for take-off and 20 mph TIAS for landing (wind measured at a 50 foot height).

1.11. CRITICAL CROSS-WIND OPERATION, CROSS-WIND GEAR. -- See page 32-3, Section III.

1.12. TYPE OF AIRPLANE OPERATION. -- The airplane is certificated in the transport category for instrument night flight when the required equipment is installed.

1.13. AUTO FEATHERING. -- The automatic feathering switch and green lights must be on for take-off, since the minimum effective take-off field lengths and the maximum take-off weights permitted are based on the use of automatic feathering if an engine failure is experienced on take-off. This is true only when automatic feathering is required for take-off.

Since automatic feathering time is dependent on two-generator operation, this airplane must not be dispatched with only one generator operating, if automatic feathering is required for take-off. When automatic feathering is required for take-off, the automatic feathering system must be checked and operative before each take-off.

1.14. FORWARD CARGO COMPARTMENT. -- The forward cargo compartment must not be loaded in such a manner as to hinder in-flight opening of this door for smoke evacuation purposes.

SECTION II

AIRPLANE OPERATING PROCEDURES

1. NORMAL OPERATING PROCEDURES.

1.1. FLIGHT RESTRICTIONS.

All flight restrictions and limitations are given in Section I.

1.2. COCKPIT CHECK - PRESTARTING.

1. C.G. limits - checked.
2. Wheels - chocked.
3. All external ground covers - removed.
4. Circuit breakers - "SET."
5. Battery switch - ground power.
6. Hydraulic fluid quantity (sight gage) - check.
7. Hydraulic hand pump shut-off valve. control - "OFF."
8. Wing flap control - "UP," then "NEUTRAL."
9. Landing gear control - "DOWN."
10. Landing gear control safety latch lever - "POSITIVE LOCK."
11. Parking brake control - "ON."
12. Cross-wind gear control - main gear locked, tail wheel unlocked.
13. Trim tab controls - as required.
14. Propeller rpm controls - "INCREASE RPM" (full forward).
15. Throttle controls - 1/4 open.

16. Mixture controls - "IDLE CUT-OFF."
17. Gust lock control (if installed) - Engaged (full forward).
18. Fuel tank selector valve controls - to front center wing tanks. Each engine must be on an individual tank for take-off.
19. Carburetor preheat controls - "COLD."
20. Static selector control - "NORMAL."
21. Fuel quantity - check.
22. Pitot and scoop heater switch - "OFF."
23. Inverter switch - either "LEFT" or "RIGHT."
24. Generator switches - "ON."
25. Propeller automatic feathering switch - "OFF."
26. Engine start selector switch - "OFF."
27. Fuel booster pump switches - "OFF."
28. Ignition switches - "OFF."
29. Landing light switches - "OFF."
30. Fire warning system - test.
31. Cowl flap switches - "OPEN."
32. Oil cooler door switches - "AUTOMATIC."
33. Door-open warning lights - off.
34. Lights - as required.
35. Cabin heater controls - as required.
36. "Seat belt" and "no smoking" sign switches - "OFF."
37. Turn on propeller de-icing system and visually check for propeller alcohol flow if icing conditions are anticipated.

1.3. PRESTART PROPELLER AUTO FEATHERING CHECK (If auto-feathering is installed and operable).

The auto feathering system blocking relay and button interlock circuit should be checked out by the ground crew prior to starting the engines before the first flight of the day as follows:

1. System circuit breakers set and airplane or ground power on.

2. Master switch - "RESET," then "ON."

3. Green lights above both feather switches should illuminate. If they do not come on, push lights to test. No light indicates that system is inoperative.

4. Move both throttles simultaneously to the take-off position. The lights in both propeller feathering buttons will come on, followed 1 3/4 seconds later by one feathering button pulling in and the respective propeller starting to feather. Immediately pull the feathering button out manually to stop the feathering cycle.

   NOTE

   This action checks the blocking relay and button interlock which prevents both propellers from feathering automatically.

5. Close the throttles.

6. Move the auto master switch to the "RESET" position and then back to the "ON" position.

7. Repeat the preceding steps using only the throttle of the engine whose propeller did not feather.

8. Auto master switch - "OFF."

   NOTE

   With the engines inoperative, the complete feathering cycle is stopped to avoid excess oil draining into the engine sump chamber, subjecting the engine to hydraulicking during the starting procedure.

1.4. STARTING ENGINES.

1. Engine start selector switch - position to desired engine.
2. Starter and starter safety switch - close. Crank engine over a minimum of eight blades as a check for hydraulicking. If no hydraulicking is evident, continue cranking and proceed as follows:
3. Fuel booster pump switch - "ON."
4. Ignition boost switch - close.
5. Primer switch - as required.
6. Ignition switch - "ON."
7. Mixture control - "AUTO RICH" after engine fires.
8. If engine does not continue to fire, return mixture control to "IDLE CUT-OFF" immediately to avoid flooding and possible hydraulicking.

1.5. ENGINE WARM-UP.

1. Operate engines at 1000 rpm until pressures and temperatures are within limits. Do not prolong engine idling below 1000 rpm.
2. Battery switch - "AIRPLANE BATTERY," ground power source disconnected.

CAUTION

Do not close cowl flaps to hasten the warm-up period, or allow cylinder head temperatures to exceed 260°C.

1.6. ENGINE OPERATING TEMPERATURES, PRESSURES, AND RPM.

Cylinder Head Temperatures:

Minimum for magneto check	120°C (248°F)

Maximum for ground	260°C (500°F)
Maximum allowable for take-off	260°C (500°F)
Maximum at rated power	246°C (473°F)
Maximum for cruise	232°C (450°F)

All ground operations should be made with the cowl flaps full open.

Oil Inlet Temperatures:

Minimum for ground check	40°C (104°F)
Desired for cruise	80°C (176°F)
Minimum for cruise	40°C (104°F)
Maximum for take-off and climb	104°C (220°F)
Maximum allowable	104°C (220°F)

Oil Pressures:

Minimum idle	15 psi
Ground run-up	70 (±5) psi at 85°C 1500 to 1800 rpm
Desired cruise	70 (±5) psi
Minimum operating	45 psi
Maximum operating	75 psi
Oil pressure warning light on at	50 (±5) psi

Fuel Pressures:

Minimum allowable	15 psi
Ground run-up	20 (±1) psi at 1500 to 1800 rpm
Desired cruise	20 (±1) psi
Booster pump pressure (engine pump inoperative, 28 volt bus)	21 (±.5) psi
Fuel pressure warning light	
on at	16 psi min. decreasing
off at	18 psi max. increasing

Engine RPM:

Idling	700 (±50) rpm
Minimum governing rpm	1250 (±50) rpm
Take-off rpm	2800 (+50,-0) rpm
Magneto check (maximum drop)	100 rpm
Tachometer variation	15 rpm

1.7. TAXIING.

1. Wheel chocks - removed.

2. Landing gear safety pins - removed.

3. Parking brake control - "OFF."

4. Tail wheel lock - as required.

NOTE

> Before unlocking the tail wheel, the airplane should be rolled forward slightly to relieve the locking pin from possible side loads.

5. Cross-wind landing gear (if installed) - locked.

6. Preferably, maneuver the airplane by differential engine power, or else by using the brakes or the rudder.

CAUTION

> Do not turn the airplane with the brakes fully applied to one wheel as this may damage the tire.

7. Use only sufficient rpm for taxiing speed. Using the brakes against high rpm will shorten brake life.

8. When stopping the taxi roll, close the throttles until the airplane has come to a stop; then reset the throttles to 1000 rpm after setting the parking brakes.

1.8. ENGINE RUN-UP. -- Both engines cannot be run-up simultaneously with the gust lock engaged; the gust-lock-throttle-interlock permits the application of more than 30 inches Hg to only one engine at a time with the gust lock engaged.

1. Propeller rpm controls - "INCREASE RPM."

2. Throttles - set to 1500 rpm.

3. Feathering check - after starting the engines prior to the first flight of the day,

the ground crew should check out the feathering system as follows:

a. Warm engines up to minimum oil temperature limits.

b. While running at 1700-1800 rpm, manually feather one propeller, allowing it to go to the full feathered position. This checks the pressure cut-out switch and clears the cold oil out of the feathering lines.

c. Adjust throttle to keep engine running.

d. Push the feathering button in to unfeather the propeller, and hold button in until propeller unfeathers to desired rpm.

e. Repeat the procedure for the other engine.

4. Move the propeller rpm controls from "INCREASE RPM" to "DECREASE RPM" and back again three or four times to force warm oil into the propeller dome. A drop of approximately 300 rpm will be sufficient change for this operation.

5. Check each generator amperage output.

6. Check vacuum pressure - 4.2 inches Hg.

*7. Perform the propeller automatic feathering check as follows:

*8. Move the auto-feather master switch to "RESET" and then to "ON" (the green indicating lights should come on).

*9. Advance the throttle of either engine to approximately 30 inches Hg (the red light on the feathering button should not come on).

*10. Hold the auto-feather test switch in the "TEST" position and retard the throttle. The red light in respective feathering button should come on at approximately 25% of take-off power, followed 1 3/4-seconds

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* Necessary only when auto-feathering is required for take-off.

later by the feathering button pulling in. Both green lights should go out, but the propeller should not enter the feathering cycle.

*11. Pull the feathering button out manually, then release the auto-feather test switch.

NOTE

> If the test switch is released before pulling the feathering button out, the propeller will go into the feathering cycle. If this happens, the feathering operation may be stopped by manually pulling out the feathering button.

*12. Repeat the automatic feathering test for the other propeller.

13. Throttles - advance to 30 inches Hg.

14. Magnetos - check. A 100 rpm drop-off is maximum.

15. All pressures and temperatures - normal.

16. Retard throttles to 1000 engine rpm.

17. For take-off when icing conditions are anticipated turn surface de-icer control "ON" and check operation of the de-icer boots. Turn on windshield heat and check windshield for heat rise. Check suction gage. Turn de-icer control "OFF."

18. Purge manifold pressure lines.

1.9. PRE-TAKE-OFF CHECK.

1. Hydraulic system and landing gear pressure gages - normal pressures.
2. Wing flap control - as required.
3. Landing gear control - "DOWN."
4. Fuel tank selector valve control - set to front center wing tanks.

*Necessary only when auto-feathering is required for take-off.

5. Carburetor air temperature controls - "COLD."

6. Tail wheel lock control - as desired.

7. Amber cross-wind landing gear indicator lights (if installed) - as desired.

8. Propeller rpm controls - "INCREASE RPM."

9. Mixture controls - "AUTO RICH."

10. Trim tabs - as required.

*11. Automatic feathering system - "RESET," then "ON."

12. Fuel booster pump switches - as required.

13. Cowl flap controls - "CLIMB."

14. Gust lock control - disengaged.

15. All controls - free.

1.10. TAKE-OFF AND CLIMB.

1. Align airplane in direction for take-off and lock tail wheel after coming to a full stop if a fixed-gear take-off is desired.

2. Controls free.

3. Advance throttles to 30 inches Hg.

4. Make a final check of fuel and oil pressures.

5. Slowly release brakes.

6. Advance throttles smoothly to 54.5 inches Hg. Rpm should be 2800 (+50, -0).

7. Do not lift tail wheel off runway too soon. Use rudder for directional control - not brakes.

8. For lift-off speeds, see Section III.

* Necessary only when auto-feathering is required for take-off

9. Landing gear control safety latch lever - full up position.

10. Landing gear control - "UP."

11. Maintain a positive rate of climb. When landing gear red warning light goes out, reduce power as required.

12. Automatic feathering switch - "OFF." (Green lights off.)

13. Maintain cylinder head temperatures within limits by adjusting cowl flaps.

14. Maintain adequate carburetor air temperatures to avoid carburetor icing.

15. Fuel tank selectors - front center wing tanks.

1.11. CRUISE.

1. Rpm and manifold pressure - as required.

2. Cowl flaps - adjust to maintain cylinder head temperature at 205°C (maximum permissible cylinder head temperature in cruise - 232°C).

3. Fuel tank selector valve controls - as required.

4. Mixture controls - "AUTO LEAN."

5. Booster pump as required.

1.12. DESCENT.

1. Maintain last cruise power settings and make a long descent at 300 to 500 feet per minute. Do not exceed placarded airspeeds.

1.13. APPROACH.

1. Fuel tank selector valve controls - position to fullest center wing tanks.

2. Carburetor air temperature controls - "COLD."

3. Mixture controls - "AUTO RICH."

4. Cowl flap controls - as required to maintain cylinder head temperatures within limits.

5. Airspeed - below 166 mph.

6. Landing gear control - "DOWN." Green lights on.

7. Landing gear control safety latch - "LOCK" (Down).

NOTE

> The landing gear warning horn will sound if the landing gear is not down when the throttles are closed.

8. Tail wheel - "LOCKED," unless the cross-wind landing gear system is to be used (if installed). See paragraph 1.16, following.

9. Hydraulic and landing gear system pressures - check.

10. Propeller controls - adjust to 2400 rpm.

11. Wing de-icer control - "OFF."

12. Airspeed - below 125 mph.

13. Wing flap control - "DOWN," at airspeeds below 133 mph. Then return to "NEUTRAL."

14. See characteristic speed chart for approach speeds.

1.14. LANDING.

Consistently good landings can be made if the final approach is made at approximately 100 - 105 mph with a 300 foot per minute rate of descent. About 12 to 15 inches Hg manifold pressure will be required to establish the correct glide. Landings should be made with tail low; upon contacting the ground, a slight forward motion on the elevator controls will keep the airplane on the ground.

NOTE

> If necessary, wheel brakes can be fully applied even though the tail wheel has not contacted the ground, provided the airspeed is above 40 mph and the control column is held all the way back.

Perform the following operations at the completion of the landing roll:

1. Cowl flap controls - "OPEN."
2. Wing flap control - "UP" then "NEUTRAL."
3. Propeller rpm controls - "INCREASE RPM."
4. Tail wheel lock control - "UNLOCK" (cross-wind landing gear, if installed, locked).

1.15. CROSS-WIND LANDING WITHOUT CROSS-WIND LANDING GEAR.

1. Keep the nose of the airplane lower than usual during the final approach.
2. Lower the windward wing. Head the airplane toward the wind sufficiently to maintain a course parallel to the runway.
3. When the airplane is within a few feet of the ground, level the wings and straighten airplane to align with runway.
4. Make a tail-up landing.
5. When the wheels contact the ground, lower the nose slightly, idle the leeward engine, and retract the wing flaps.

NOTE

The airplane is much less affected by horizontal wind gusts when the flaps are retracted.

6. Increase the power of the windward engine as necessary to maintain the directional course of the landing roll.

1.16. CROSS-WIND LANDING USING SPECIAL CROSS-WIND LANDING GEAR (IF INSTALLED).

The final approach procedure for making a cross-wind landing using the special cross-wind landing gear is essentially the same as for making a cross-wind landing with standard gear.

1. After the gear is extended and locked, pull the tail wheel lock control full aft to unlock both the tail wheel and the cross-wind gear. Amber lights should come ON.

2. Keep the nose of the airplane slightly lower than normal, lower the windward wing, and head the airplane into the wind sufficiently to maintain a parallel course with the runway.

3. Maintain this attitude throughout the flare and ground contact. As the main gear wheels make initial contact with the ground, they will automatically swivel on the gear axle to track parallel with the landing roll, leaving the airplane at its original attitude of an angle off parallel to the runway.

4. After the tail wheel has made contact with the ground, use the rudder to straighten the airplane relative to the direction of roll.

5. At the end of the landing roll, and before taxiing, place the tail wheel lock control in the middle position to lock the main gear, leaving the tail wheel unlocked and free to caster.

1.17. STOPPING ENGINES.

1. If the cylinder-head temperatures exceed 205°C, idle the engine at 1000 rpm until the temperature is below this figure.
2. Propeller rpm controls - "INCREASE RPM."
3. Throttle controls - 1000 rpm minimum.
4. Mixture controls - "IDLE CUT-OFF."

NOTE

The mixture controls should be kept in "IDLE CUT-OFF" at all times the engines are inoperative.

5. After engine has stopped, turn ignition switches - "OFF."
6. Generator switches - "OFF."
7. Battery master switch - "OFF."
8. All remaining switches - "OFF."

1.18. BEFORE LEAVING AIRPLANE.

1. Fuel tank selector valve controls - "OFF."
2. Wing flap control "NEUTRAL."
3. Landing gear control "DOWN."
4. All radio and electrical switches - "OFF."
5. All trim tab controls - "O."
6. Parking brake control - "ON" after brakes have cooled.
7. Landing gear safety pins - installed.
8. Main gear wheels chocked.
9. Gust lock - engaged (if installed; otherwise surface locks installed).

2. EMERGENCY OPERATING PROCEDURES.

2.1. ENGINE FAILURE ON TAKE-OFF.

2.1.1. ENGINE FAILURE BEFORE REACHING SAFE SINGLE-ENGINE AIRSPEED ON THE GROUND.

1. Cut both throttles.
2. Firewall shut-off valve controls - Pull "CLOSE."
3. Mixture controls - "IDLE CUT-OFF."
4. Ignition, generator, and battery switches - "OFF."
5. Fuel tank selector valve controls - "OFF."
6. Apply brakes.

2.1.2. ENGINE FAILURE AFTER REACHING SAFE SINGLE-ENGINE AIRSPEED. -- If an engine fails after reaching the safe single-engine airspeed, proceed as follows:

1. Maintain take-off climb speed V_2, as shown in Section III.
2. Feather propeller on inoperative engine when auto-feathering is not used.
3. Adjust power controls of the remaining engine to ensure safe single-engine performance.
4. Maintain the cowl flaps on the operating engine in the climb position. Close cowl flaps on feathered engine.
5. Retrim the airplane as required.
6. If a subsequent attempt is made to start the engine, follow the procedure in paragraph 2.2.2., following.

2.2. ENGINE ISOLATION.

2.2.1. PROPELLER FEATHERING PROCEDURE. -- If it becomes necessary to shut an engine down in flight, feather the propeller as follows. The feathering procedure is grouped into Phases, the individual steps of which may be performed in a sequence suitable to the operator. All operations in Phase I, however, must be accomplished prior to any operations in Phase II, etc.

PHASE I. Mixture Control - "IDLE CUT-OFF."
Feathering button - push IN.

Note

If there is any evidence of fluid supply line failure ahead of the firewall or of fire in the nacelle area, pull up the firewall shut-off valve handle to shut off the oil, fuel, and hydraulic fluid to that engine at the firewall.

PHASE II. Oil cooler control - "CLOSED," then "OFF."
Cowl flap control - "CLOSED," then "OFF."
Fuel booster pump - "OFF."
Generator switch - "OFF."
Ignition switch - "OFF."
Throttle - "CLOSED."
Propeller rpm control - "DECREASE RPM."
Fuel tank selector valve control - "OFF."
Vacuum selector control - "CAPTAIN'S INST. LIVE ENG."
Gear and flaps - check.

2.2.2. PROPELLER UNFEATHERING PROCEDURE. -- If an attempt is made to start an inoperative engine in flight (and the engine was not shut down because of fire), proceed as follows:

PHASE I. Reduce airspeed to 160 mph.
Firewall shut-off valve control - push down.
Fuel tank selector valve control - as desired.
Carburetor air control - "COLD."
Throttle - "CLOSED."

Propeller rpm control - "DECREASE RPM."
Ignition switch - "BOTH."
Fuel booster pump switch - "ON."
Generator switch - "ON."
Oil cooler control - "AUTO."
Cowl flap control - "CLOSE."

PHASE II. Propeller feathering button - push IN until propeller windmills at 600 to 800 rpm; then pull button OUT.
Mixture control - "AUTO RICH."

PHASE III. Warm the engine up gradually to ensure complete oil circulation, then increase power to desired settings.

2.3. FIRE CONTROL.

2.3.1. ENGINE SECTION FIRE. -- The engine section is divided into two zones: the power section, forward of the inner ring, and the accessory section, aft of the inner ring and forward of the firewall. Both zones are equipped with fire detectors, but only the accessory section is protected by CO_2. If an engine section fire occurs in flight, immediately perform the following operations on the affected engine. These are grouped into phases, the individual steps of which may be performed in any suitable sequence. All operations in Phase I, however, must be accomplished prior to any operations in Phase II, etc.

PHASE I. Propeller - feather.
Mixture control - "IDLE CUT-OFF."
Firewall shut-off valve control - pull UP.
CO_2 selector control - select area for discharge.
CO_2 discharge handle - pull (LH handle--straight pull; RH handle -- push button on handle, then pull. Push button on RH handle provides a different kind of action to release to reduce possibility of pilot discharging both CO_2 charges in rapid sequence inadvertently).
Cowl flaps - full "OPEN," then "OFF."

PHASE II. Booster pumps - off.
Generator - off.
Ignition - off.
Throttle - closed.
Propeller rpm - "DECREASE RPM."
Fuel tank selector valve control - "OFF."

PHASE III. Cowl flaps (after fire is out) - "CLOSED," then "OFF."
Oil cooler doors - "CLOSED," then "OFF."
Carburetor air control - "COLD."
Vacuum selector control - "CAPT. INST. LIVE ENGINE."

DO NOT RESTART ENGINE IN WHICH FIRE HAS OCCURRED. LAND AS QUICKLY AS PRACTICABLE.

Note

Do not extend the landing gear or flaps until the last possible moment before landing to prevent extensive fire damage to the landing gear system or flaps.

If a second fire occurs in the same area, or the first fire is not extinguished with the first discharge of CO_2, pull UP the second discharge handle. However, do not release the second CO_2 discharge until the first discharge has proved ineffective to avoid wasting CO_2. See paragraph 2.4. for emergency descent procedures.

2.3.2. FUSELAGE FIRE. -- In the event of smoke or fire in the cockpit, cabin, or heater compartment, perform the following steps immediately before taking any fire control action. After these preliminary steps have been accomplished, subsequent operations will depend on the various types of fire, as detailed in the applicable paragraphs immediately following.

PHASE I.

1. Combustion heater - OFF.

2. Ventilating air check valve control - "OPEN."

3. Cockpit and windshield temperature control - "COLD."

4. Cabin temperature control - "COLD."

PHASE II.

1. Fuel booster pumps - off.

2. Alcohol de-icer system - off.

3. Passenger oxygen system - off.

2.3.3. HEATER COMPARTMENT FIRE. -- If a fire occurs in the heater or the heater compartment, proceed as follows after completing the preliminary steps in paragraph 2.3.2.

1. Start descent to lowest safe altitude.

2. Fire extinguisher selector control - "HEATER COMPT."

3. CO_2 discharge handle - pull UP (LH handle-straight pull; RH handle-push button on handle, then pull. Push button on RH handle provides a different kind of action to release to reduce possibility of pilot discharging both CO_2 charges in rapid sequence inadvertently).

4. Land as soon as practicable.

Note

If a second discharge of CO_2 is required, do not release the CO_2 until three minutes after the first discharge.

2.3.4. ELECTRICAL SYSTEM FIRE. -- If smoke or fire is definitely determined as being of electrical origin, and the source is found, proceed as follows - after performing the preliminary steps in paragraph 2.3.2. preceding.

1. Battery and generator switches - "OFF."

2. Use hand fire extinguishers to combat fire.

WARNING

WHEN SPRAYED ON A FIRE OR HEATED SURFACE CARBON TETRACHLORIDE PRODUCES PHOSGENE, A VERY TOXIC GAS, WHICH IS HARMFUL EVEN IN SMALL AMOUNTS AND MAY PROVE HAZARDOUS IF INHALED IN SUFFICIENT QUANTITIES.

3. Make certain the circuit breaker for the involved electrical circuit is tripped before restoring power.

If the source of the electrical fire is not determined, proceed as follows:

1. All circuit breakers (except those bordered with red) - "TRIPPED."
2. Generators and field circuit breakers (one circuit breaker at a time) - "SET."
3. Battery switch - "ON."
4. Inverter switch - "ON."
5. Other circuit breakers (one at a time) - "SET."
6. When the source of fire or smoke has been determined, leave that circuit inoperative and restore power to the remaining circuits.

Note

If the involved circuit cannot be determined, trip circuit breakers except those with red borders, and land as soon as practicable.

2.3.5. SMOKE EVACUATION. In the event of heavy smoke concentration in the cockpit, set the heating controls serving the affected area to "COLD" or "OFF;" "OPEN" the ventilating air check valve and perform the following steps immediately:

1. Start descent to lowest safe altitude.
2. Keep door between cockpit and cabin closed.
3. Keep cockpit side windows closed.
4. Open forward cargo door.

In the event of heavy smoke concentration in the forward end of the cabin, perform the following steps immediately:

1. Start descent to lowest safe altitude.
2. Open door between cockpit and cabin.
3. Keep cockpit side windows closed.
4. Open forward cargo door.

In the event of heavy smoke concentrations in the aft end of the cabin, perform the following steps immediately:

1. Start descent to lowest safe altitude.
2. Keep door between cockpit and cabin closed.
3. Keep cockpit side windows closed.
4. Keep forward cargo door closed.
5. Open aft cargo compartment emergency ventilator.

In the event of heavy smoke concentrations in the aft cargo compartment, perform the following steps immediately:

1. Notify pilot to start descent immediately.
2. Keep door between cockpit and cabin closed.
3. Keep forward cargo door closed.
4. Keep emergency ventilator in aft cargo compartment closed.
5. Find source of smoke and use hand fire equipment.
6. Open emergency ventilator ONLY AFTER FIRE IS OUT.

2.3.6. VENTILATION SYSTEM SMOKE. -- If smoke is evidenced in the ventilating system by discharging from the ventilating outlets, proceed as follows - after performing the preliminary steps in paragraph 2.3.2.

1. Descend to lowest safe altitude.

2. Ventilating air check valve control - "OPEN."

3. Cabin temperature control - "COLD."

4. Cockpit and windshield temperature controls - "COLD."

5. Forward cargo door - open.

6. Door between cockpit and cabin - open.

7. Emergency ventilator - "OPEN."

2.3.7. MISCELLANEOUS FIRE EQUIPMENT. -- Hand fire extinguishers are located in the cabin and cockpit to be used on localized fires at the crew's discretion. Operating instructions for each extinguisher are attached to each extinguisher. In the event of a localized fire in the cabin or cockpit, the following steps are to be taken immediately:

1. Start descent to the lowest safe altitude.

2. Fight the fire with a portable fire extinguisher or any other non-inflammable liquid available.

3. If fire or smoke is severe, follow the smoke evacuation and/or emergency descent procedure.

2.4. EMERGENCY DESCENT PROCEDURE.

When an emergency demands a descent from altitude at the highest possible speed, use the following procedure:

1. Descend at a maximum of 250 mph TIAS, gear and flaps "UP."

2. If this procedure cannot be used, descend as rapidly as possible, observing flap and gear down speed restrictions.

2.5. TWO-ENGINE GO-AROUND. -- A normal go-around with both engines operating can be performed as follows:

1. Apply throttle and rpm as required to the maximum allowable limits.
2. A climb-out attitude should be attained smoothly.
3. Unlock landing gear control safety latch lever.
4. Raise landing gear.
5. Pull flaps full "UP." Increase the attitude of the airplane sufficiently to ensure no loss of altitude.

Note

Flaps and gear may be raised simultaneously.

6. Allow airspeed to increase slowly to 130 mph TIAS.
7. Set cowl flaps to maintain cylinder head temperatures within limits.

2.6. SINGLE-ENGINE GO-AROUND. -- A single-engine go-around in this airplane can be accomplished by observing the same procedures as those for two-engine go-around. For single engine control of the airplane in flight, refer to paragraph 2.7., following.

2.7. SINGLE-ENGINE APPROACH. -- A single-engine approach can be performed as follows:

1. Maintain an airspeed 10 mph higher during a single-engine approach than during a normal approach.
2. Do not lower more then half flaps until it is certain the throttle can be cut and a safe landing be made.
3. The use of ailerons to bank the airplane towards the operating engine will reduce rudder angle and forces.

2.8. MALFUNCTIONING HEATER.

If the combustion heater will not furnish heat in flight, perform the following steps to attempt to bring it into operation:

1. Check for adequate fuel supply in the right front center wing tank.

2. Check the heater and ground blower circuit breakers to make certain they are all set.

3. Check to see if the heater-inoperative warning light is on. If it is, check to make certain the cabin air check valve control is in the "OPEN" position. If it is, the heater drop-out switch has tripped, causing the heater main fuse to blow; no further operation of the heater is possible until the condition causing the switch to trip has been determined and corrected and the fuse replaced by the ground crew.

2.9. HYDRAULIC SYSTEM FAILURE.

The following procedures can be used to operate the hydraulic system units in the event of main system failure. Failure of the normal hydraulic system will usually be indicated by the loss of both system pressure and of fluid in the sight gage on the reservoir (the hydraulic fluid reserve of 3.2 quarts does not show on the sight gage). In the event of system failure, reduce airspeed, place the controls of all hydraulically operated units to the "OFF" or "NEUTRAL" positions, and proceed as follows:

1. To lower the landing gear, reduce airspeed below 166 mph TIAS, place the landing gear control lever down, and operate the hydraulic hand pump to extend and lock the gear. If the green landing gear lights do not come on, indicating the gear is down and locked, the gear can then be snapped down and locked by applying 1.4 to 1.6 "G" acceleration to the airplane (this is equivalent to the force resulting from a normal 30-degree turn).

2. To lower tne wing flaps, reduce airspeed below 125 mph TIAS, place the wing flap control "DOWN" and operate the hydraulic hand pump. It will require approximately

11 cycles of the hand pump to fully extend the wing flaps.

3. To operate the brakes, make a normal landing and operate the hydraulic hand pump for the required braking action. Avoid pumping the brake pedals, as pressure will be lost with each pump.

2.10. AIR BRAKE OPERATION. -- If no hydraulic pressure is available to the brakes, stop the airplane with the air brake system. Apply the brakes slowly and intermittently after ground speed has been reduced by an extended roll, gradually increasing the braking power rather than applying it suddenly.

2.11. STALL WARNING SYSTEM. -- A Stall Warning System is installed to give warning at approximately ten mph above stalling speed. An audible interrupted horn and a visual red warning light on the instrument panel are provided as warning signals. The system is made inoperative when the airplane is firmly on the ground to avoid nuisance operation during the landing roll.

2.12. USE OF FUEL BOOSTER PUMPS.

It is recommended that the fuel booster pumps be operated under the following conditions:

1. For engine start.
2. For take-off at any time the ground temperature is above 100°F.
3. For take-offs above 2500 feet.
4. During climb after reaching 10,000 Feet (if take-off was made with the booster pumps on, leave then on throughout climb to cruising altitude).
5. When selecting a new fuel supply.
6. At any time that fuel pressure falls below 17 psi or fluctuates.

SECTION III

PERFORMANCE DATA

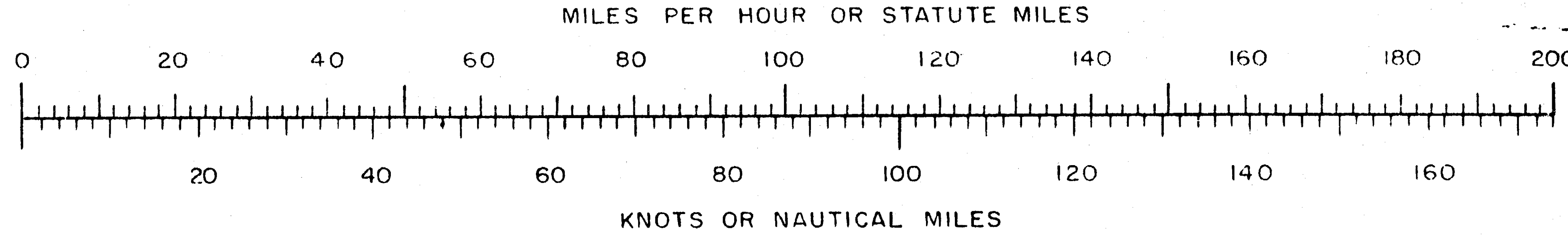
EXAMPLE

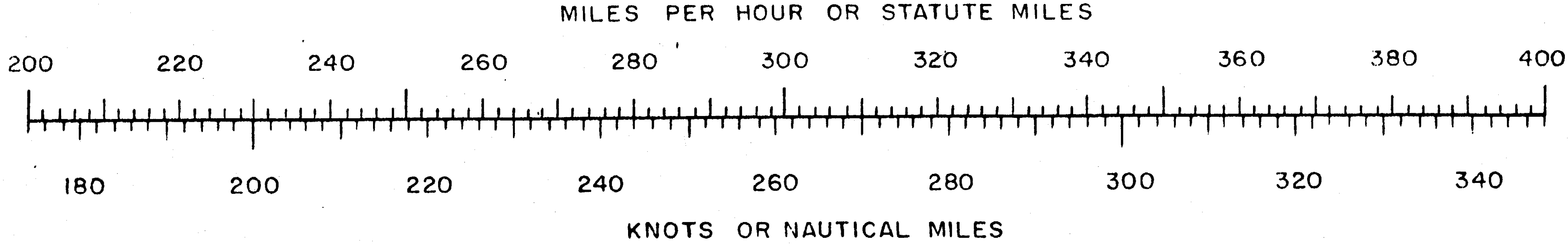
MPH = 1.15 KNOTS

KNOTS = .87 MPH

115 MPH = 100 KNOTS

87 KNOTS = 100 MPH





MILES PER HOUR TO KNOTS CONVERSION TABLE

PERFORMANCE CHARTS

SECTION III

PERFORMANCE INFORMATION

Introductory Information

A. All climb data are for standard atmospheric conditions.

B. The minimum effective take-off runway lengths given in this section are defined as the longer of the 'accelerate-stop distance' and the distance required to take-off and clear a 50 ft. obstacle with one engine becoming inoperative at speed V_1. In the case of the Super DC-3 the distance required to take-off and clear a 50 ft. obstacle is always the greater.

1. The accelerate-stop distance is the distance required to accelerate the airplane from a standing start to the speed, V_1, and assuming an engine to fail at this point, to stop.

2. The take-off distance is defined as the sum of the following:

   a. Distance to accelerate to speed V_1 with all engines operating.

   b. Distance to accelerate from speed V_1 to speed V_2 with one engine inoperative and propeller windmilling in low pitch. It is assumed that gear retraction is initiated at the end of this segment. In the Super DC-3, $V_1 = V_2$ so transition distance becomes zero.

   c. The horizontal distance traveled in climbing to a height of 50 feet at speed V_2 with one engine inoperative. It is assumed that propeller feathering is not commenced prior to the end of this segment with manual feathering. With automatic feathering the propeller is assumed feathered instantaneously at engine failure speed.

d. Speed V_1 is defined as the critical engine failure speed and for the Super DC-3 is equal to the minimum take-off climb speed as defined below.

e. Speed V_2 is defined as the minimum take-off climb speed and is the greater of the following:

   1.20 times the power off stalling speed with the flaps in the take-off position.

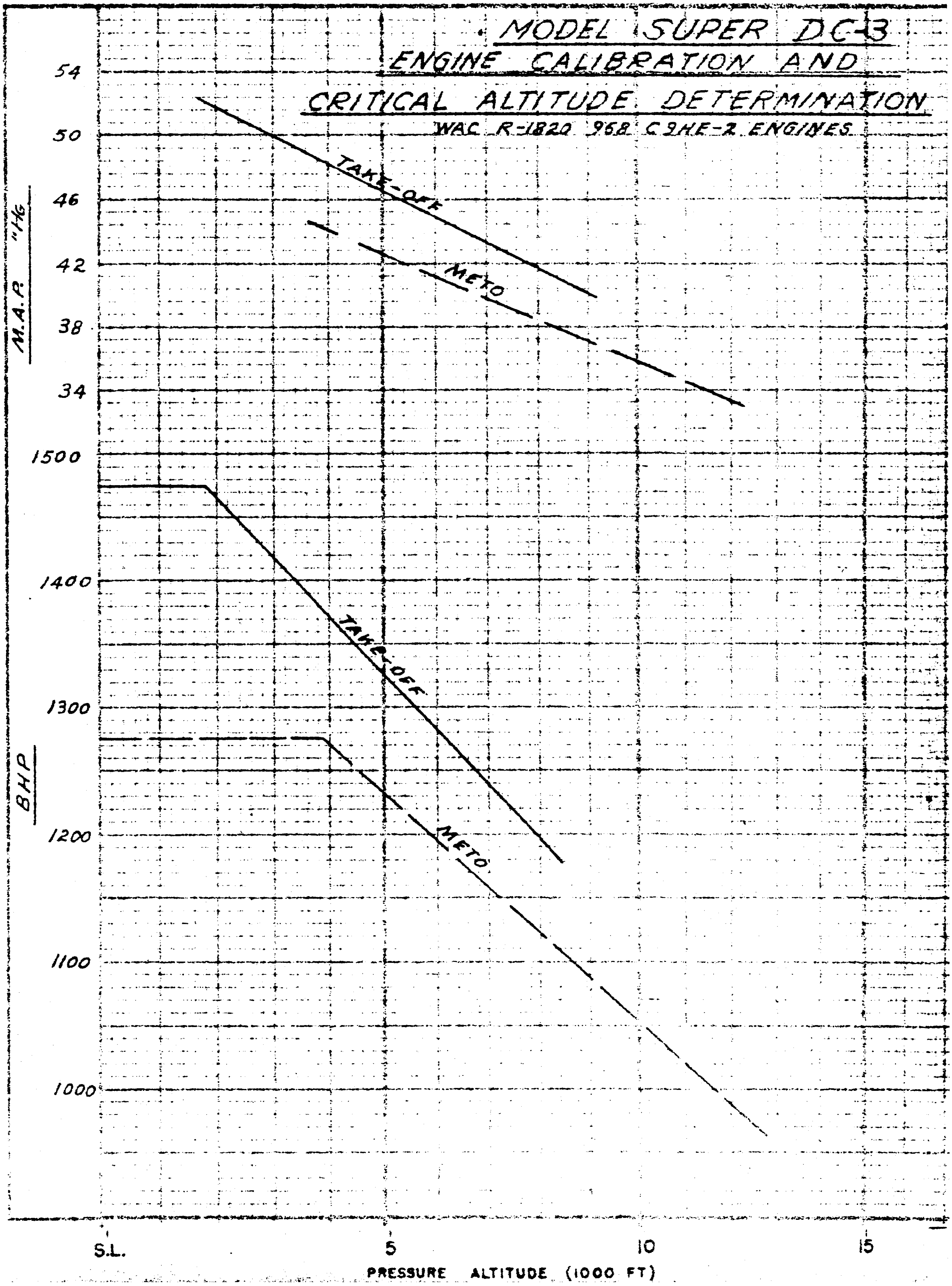
   1.10 times the minimum control speed, V_{mc}.

f. The minimum control speed, V_{mc}, is defined as the minimum speed at which the airplane is controllable in flight with the sudden failure of an engine with take-off power on the remaining engine.

3. All runway lengths given in this manual are based on the fact that $V_1 = V_2 = 1.20$ times the power off stalling speeds with the flaps in the take-off position. This speed selection is such that the distance to clear a 50 ft. obstacle with one engine becoming inoperative at this speed is always greater than the distance to accelerate and stop.

4. All take-off and landing distances given are for dry, concrete runways.

5. The maximum crosswind component in which this airplane has been tested is 20 mph measured at a height of 50 feet above the ground. Consequently, in determining the effective take-off and landing runway lengths, a crosswind component greater than this value may not be used.

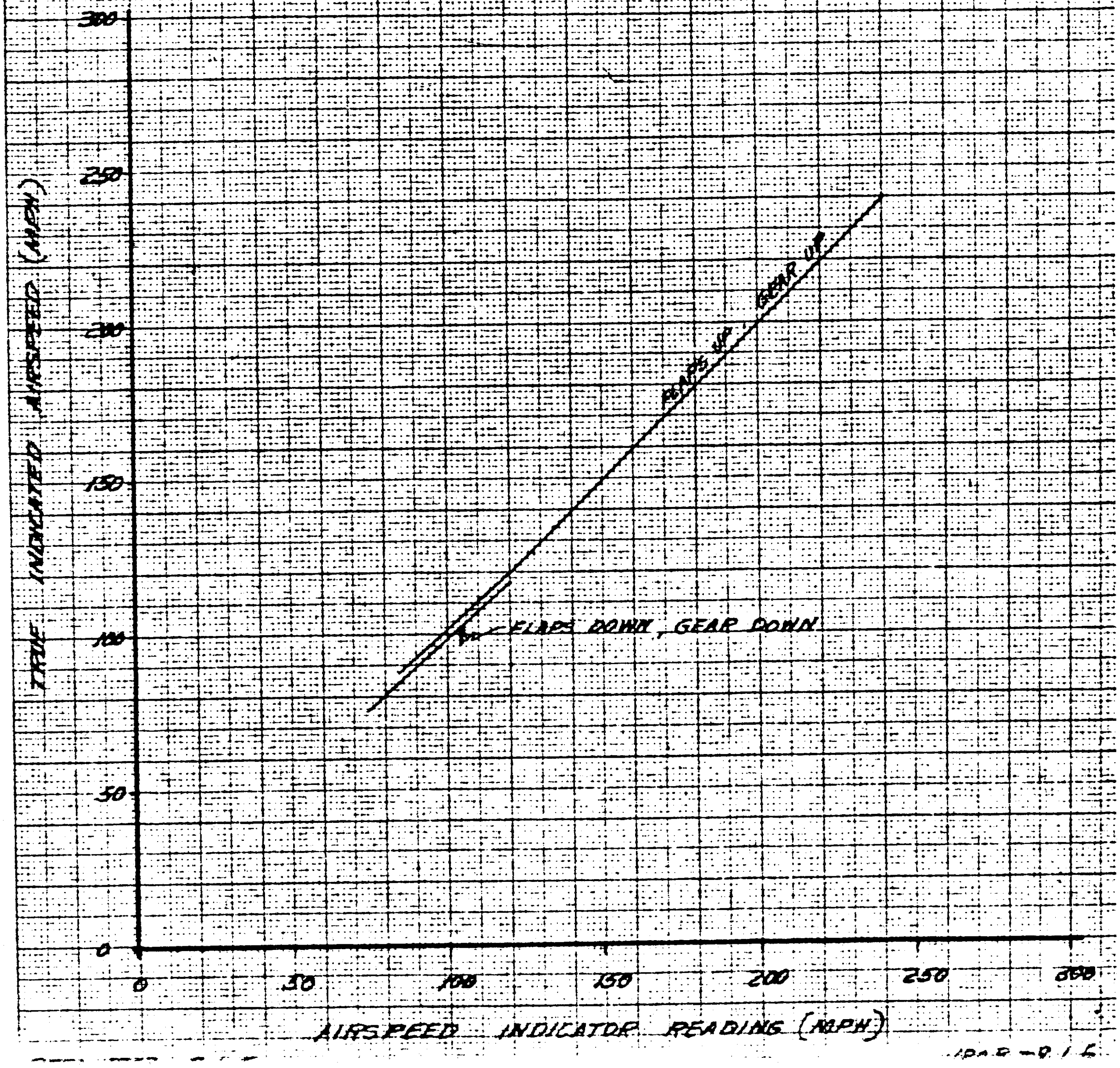


MODEL SUPER DC-3
ENGINE CALIBRATION AND
CRITICAL ALTITUDE DETERMINATION
WAC R-1820 968 C9HE-2 ENGINES

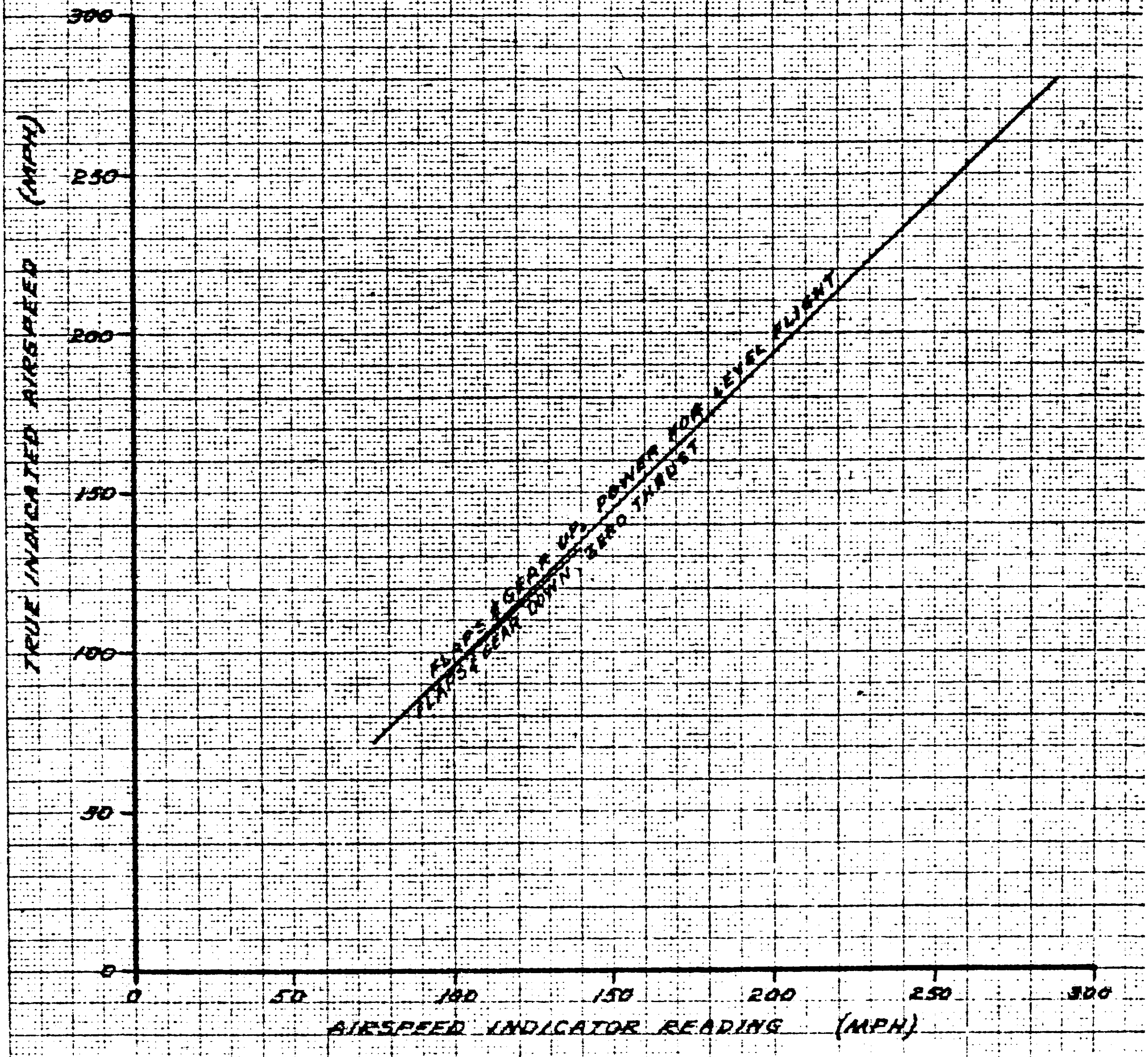
MODEL SUPER DC-3

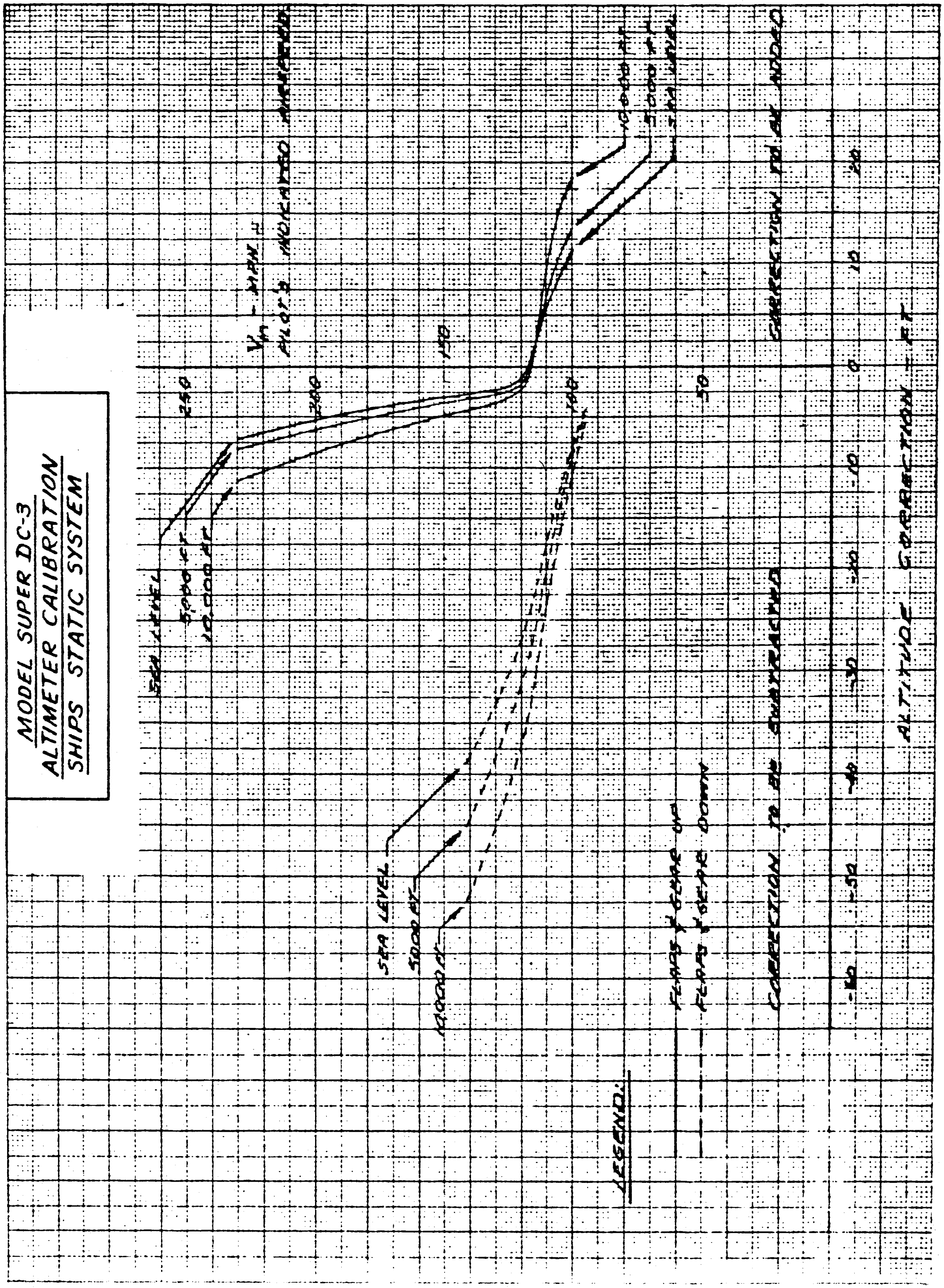
AIRSPEED CALIBRATION

FOR NOSE PITOT & SKIN STATIC INSTALLATION



MODEL SUPER DC-3
AIRSPEED CALIBRATION
SHIPS ALTERNATE STATIC SYSTEM

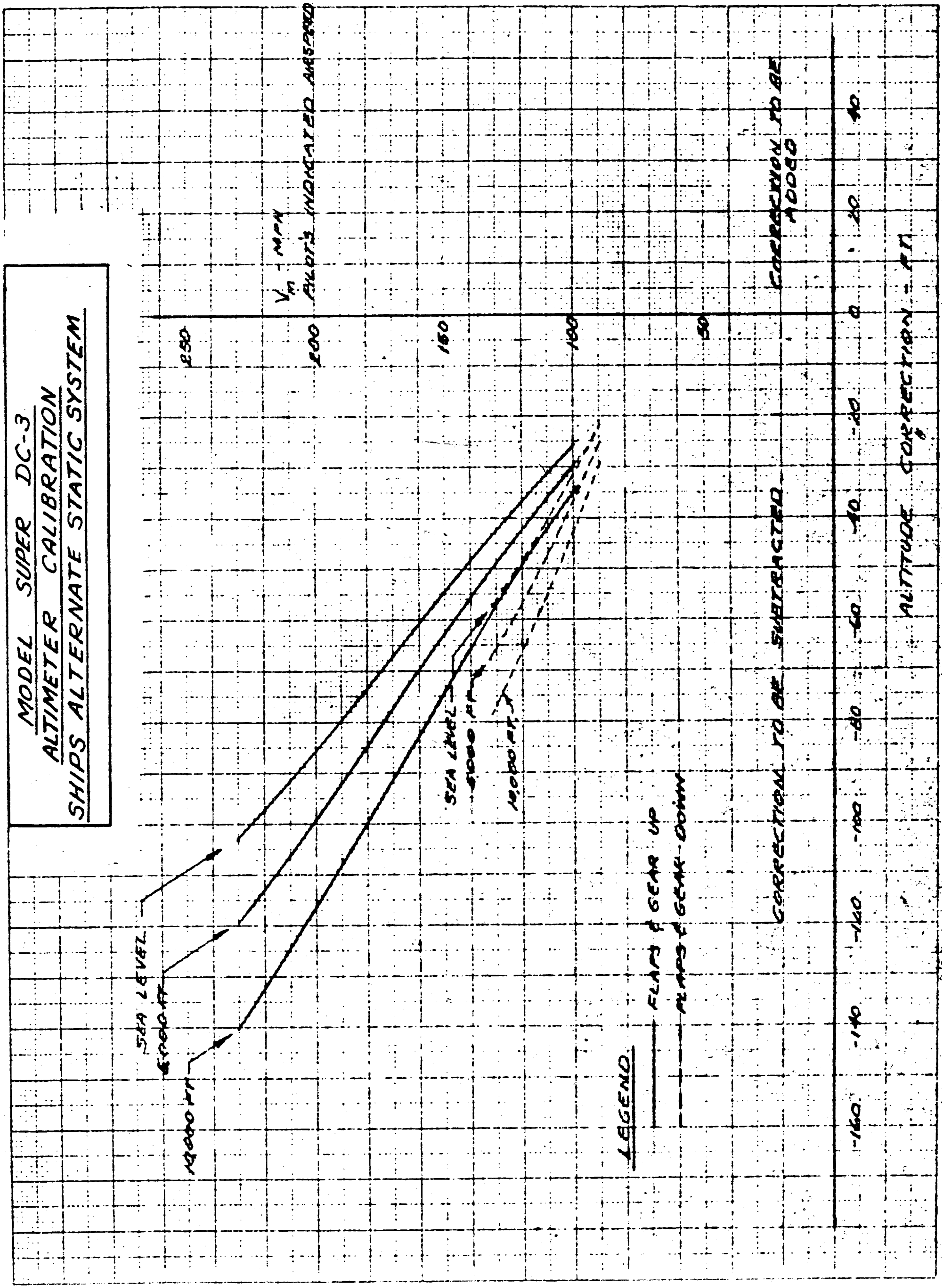




MODEL SUPER DC-3
ALTIMETER CALIBRATION
SHIPS STATIC SYSTEM

Analysis
Prepared by J.M. PALMER
Date 7-20-50

Model
Report No.

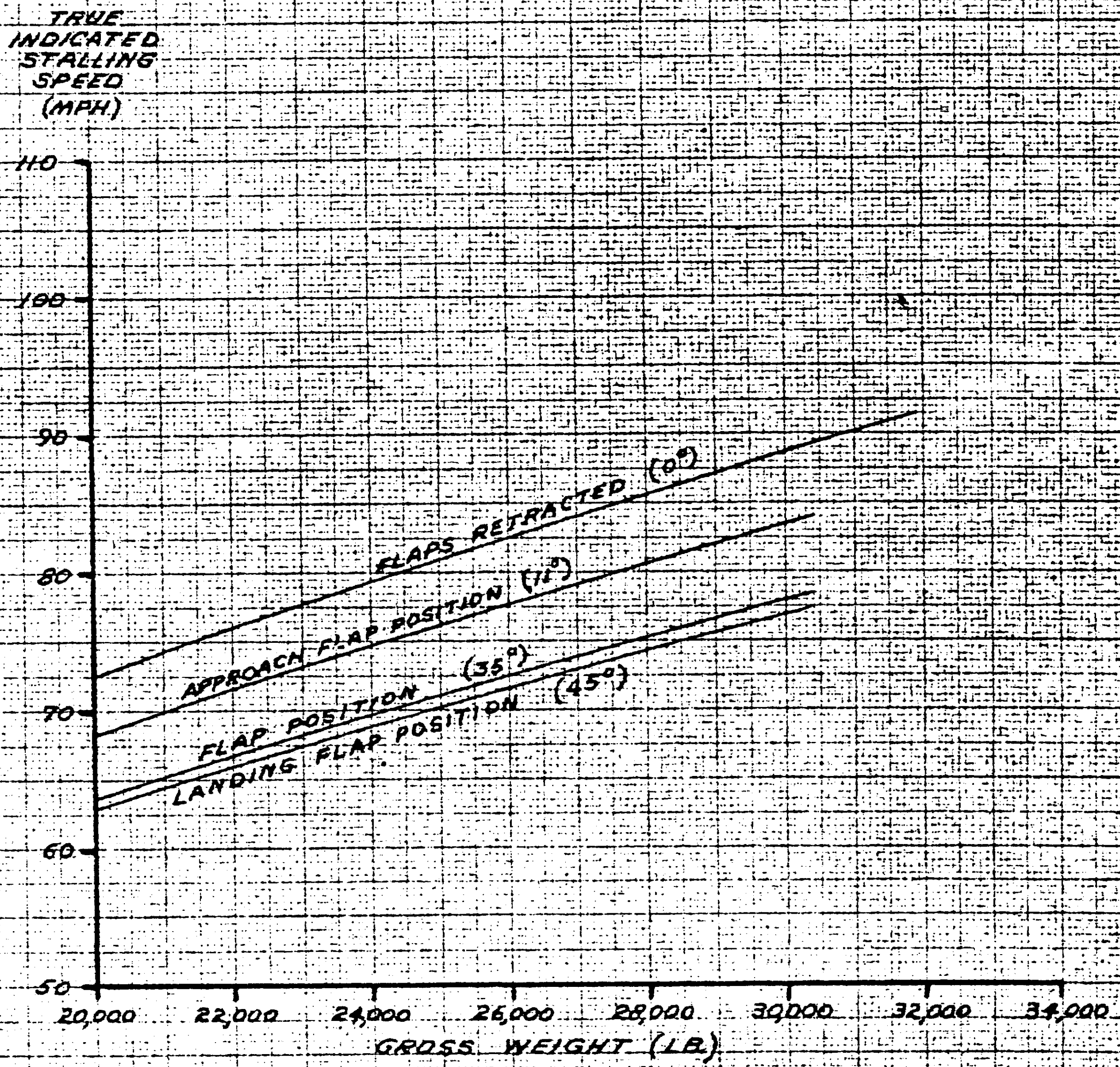


MODEL SUPER DC-3
ALTIMETER CALIBRATION
SHIPS ALTERNATE STATIC SYSTEM

Analysis PERFORMANCE
Prepared by AERODYNAMICS
Date 3-23-50
REV. 7-24-51, 9-8-54

MODEL SUPER DC-3
TRUE INDICATED STALLING SPEEDS vs GROSS WEIGHT

ZERO THRUST
PROPELLERS IN LOW PITCH
C.G. AT 10.0% MAC



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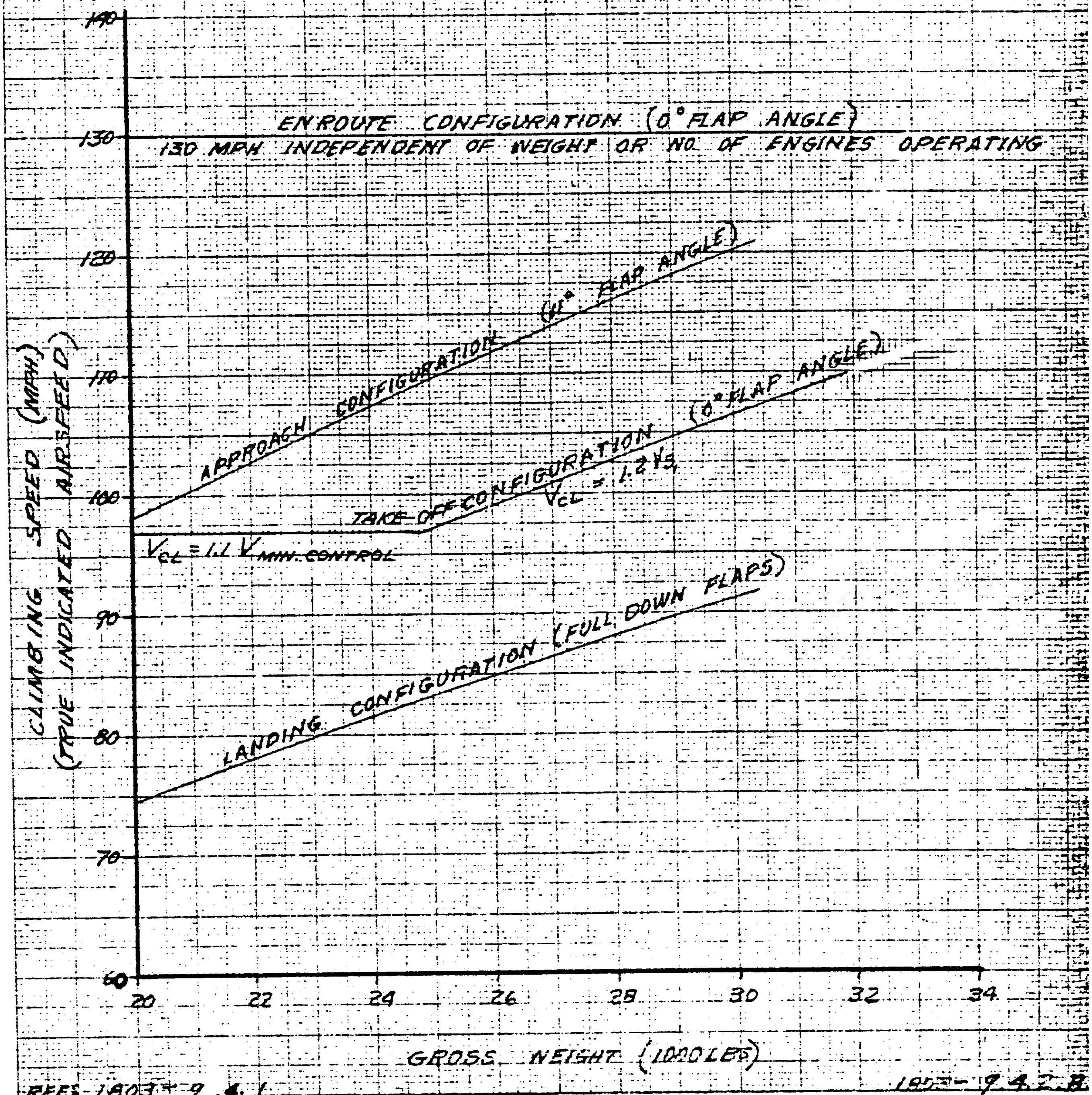
MODEL SUPER DC-3
TRUE INDICATED CLIMBING SPEEDS
VS
GROSS WEIGHT

WAC R-1820 968 C9HE-2 ENGINES
HAM STD PROPELLER 2-3417A BLADE 6615A-0
WITH AUTO FEATHERING



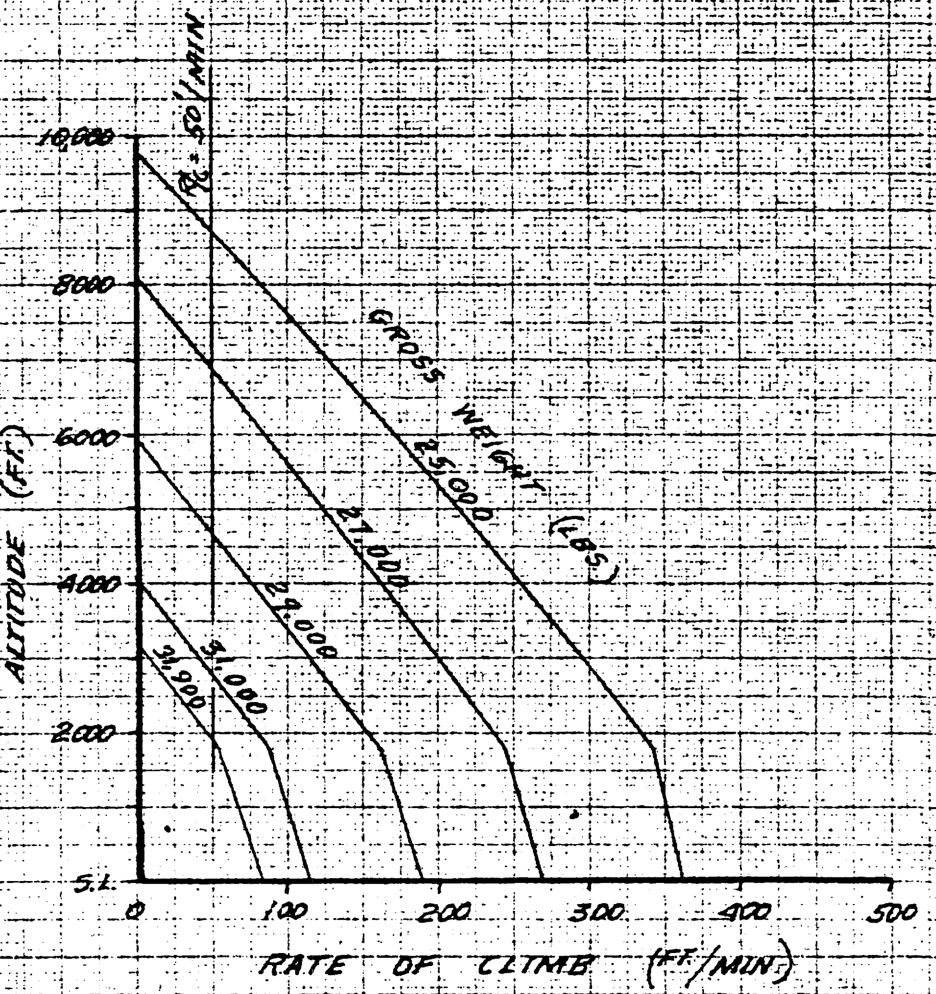
REV. 9-8-54

MODEL SUPER DC-3

FIRST SEGMENT TAKE-OFF CLIMB

PROPELLER FEATHERED ON INOPERATIVE ENGINE

WAC R-1820 968 C9HE-2 ENGINES
HAM. STD. PROPELLER I-3417A, BLADE 6615A-0
WITH AUTO FEATHERING
FLAPS UP GEAR DOWN
COWL FLAP SETTING = BOTH ENGINES + 6 DEG.
STANDARD ATMOSPHERIC CONDITIONS
TAKE-OFF ENGINE POWER



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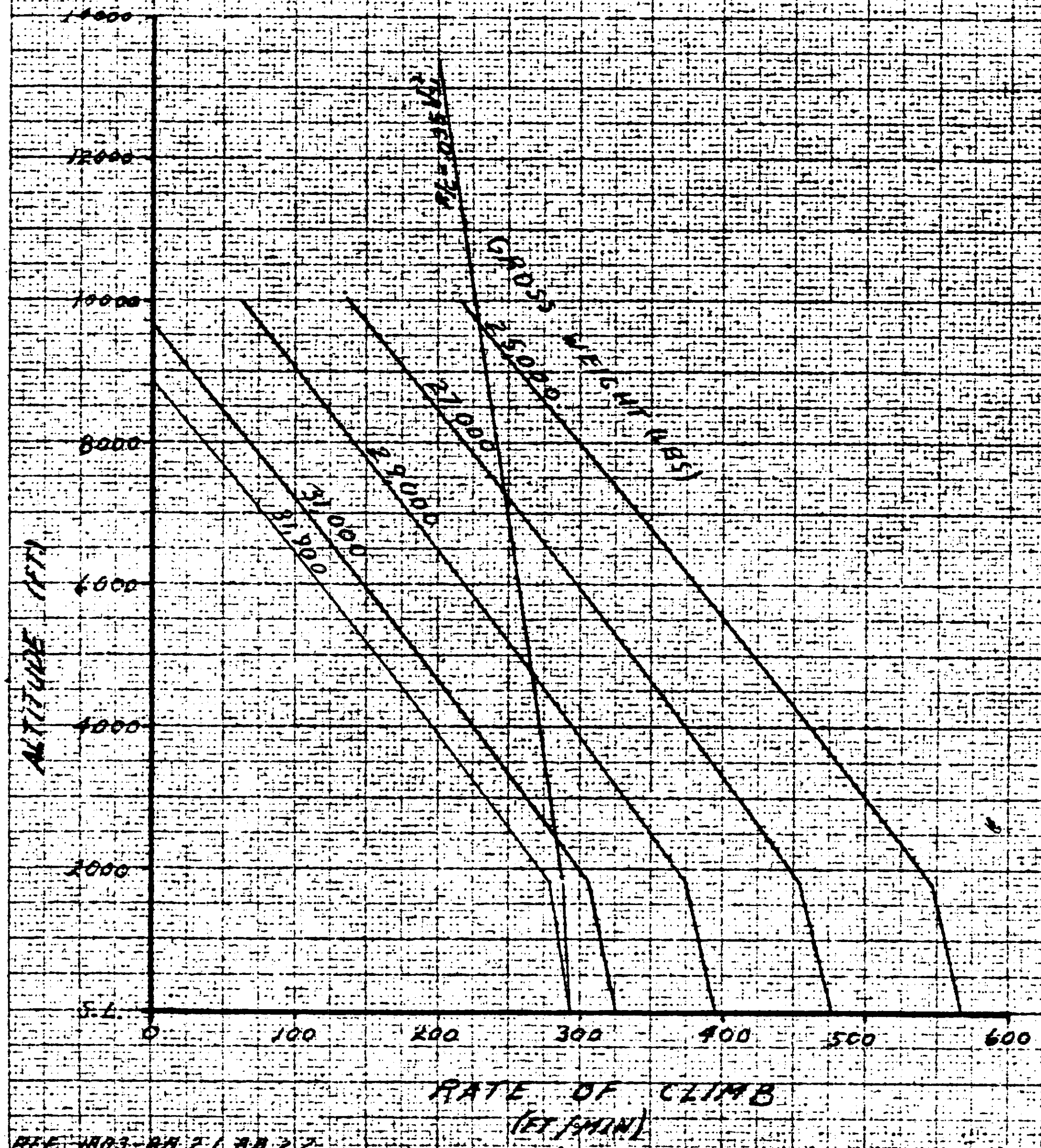
MODEL SUPER DC-3

SECOND SEGMENT TAKE-OFF CLIMB

PROPELLER FEATHERED ON INOPERATIVE ENGINE

WAC R-1820 968 C9HE-2 ENGINES
HAM STD PROPELLER I-3417A, BLADE 6615A-0
WITH AUTO FEATHERING
FLAPS UP GEAR UP
COWL FLAP SETTING: BOTH ENGINES 16 DEG
STANDARD ATMOSPHERIC CONDITIONS
TAKE-OFF ENGINE POWER



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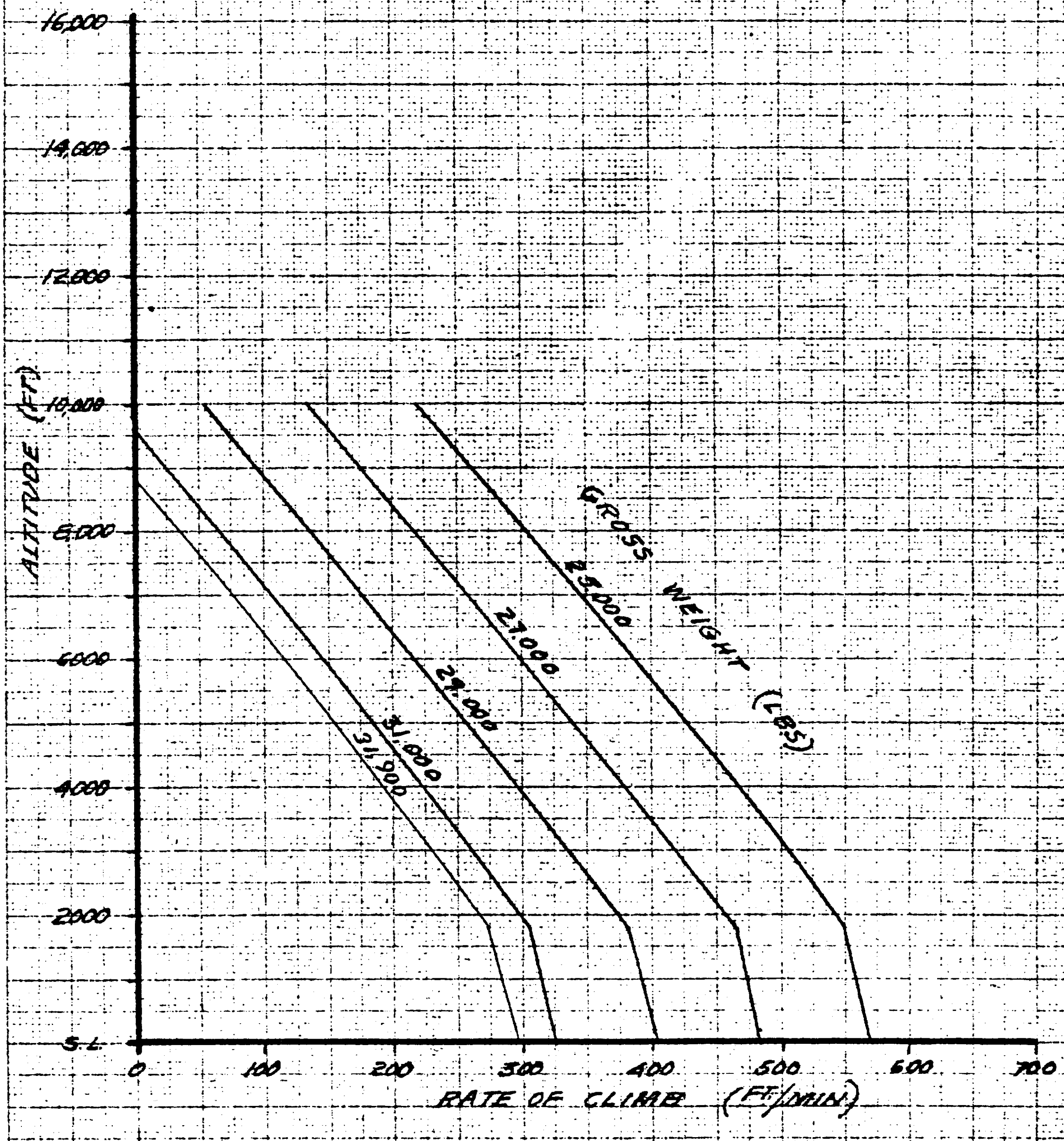
1803-AA 2.5A

2-10-55

MODEL SUPER DC-3
THIRD SEGMENT TAKE-OFF CLIMB
PROPELLER FEATHERED ON INOPERATIVE ENGINE

WAC R-1820-96B C9HE-2 ENG
HAM STD PROPELLER I-3417A, BLADE 6615A-0
WITH AUTO FEATHERING
FLAPS UP GEAR UP
COWL FLAP SETTING: OPERATING ENGINE + 6 DEG.
INOPERATIVE ENGINE CLOSED
STANDARD ATMOSPHERIC CONDITIONS
TAKE-OFF ENGINE POWER



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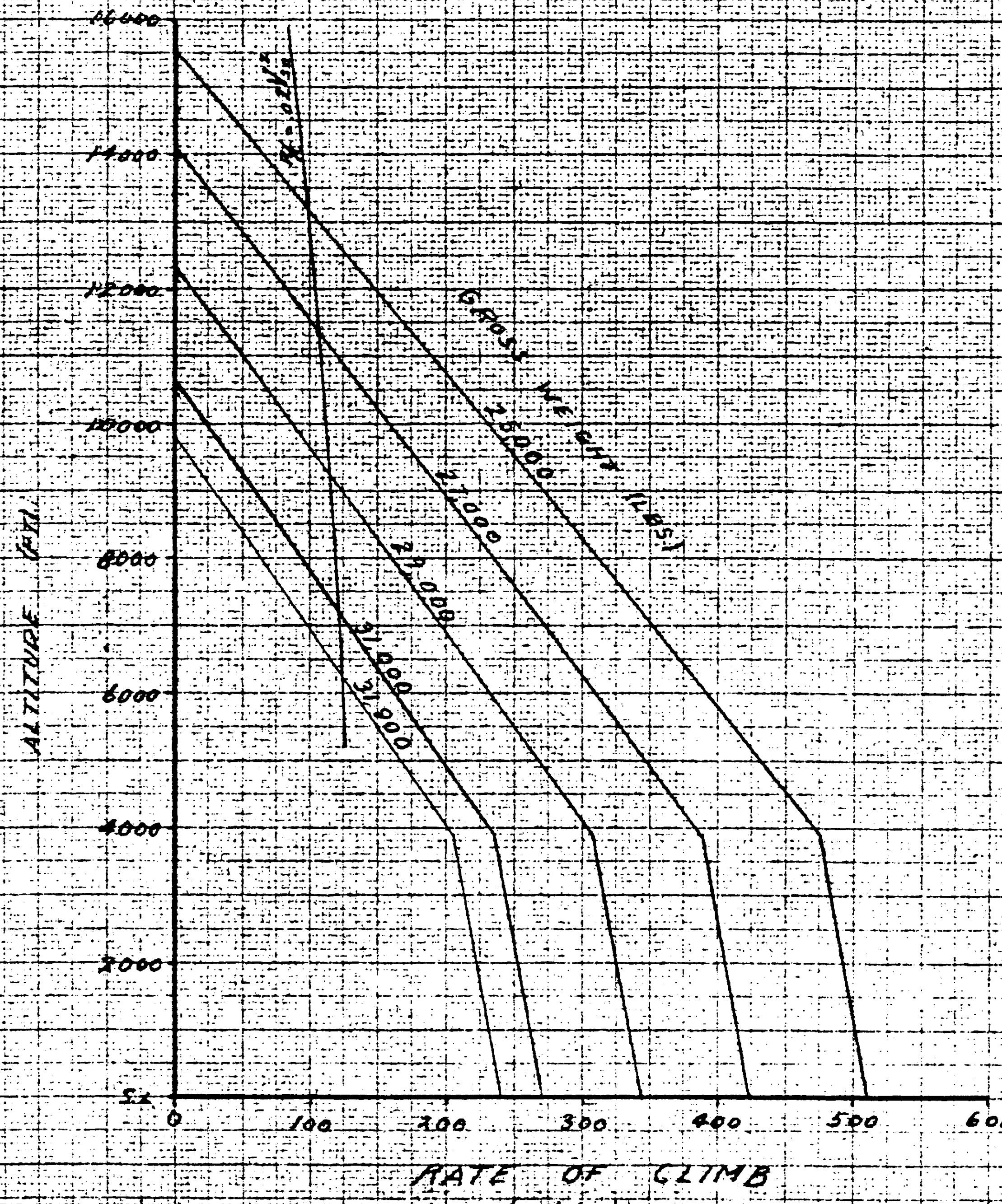
MODEL SUPER DC-3
ONE ENGINE ENROUTE CLIMB
PROPELLER FEATHERED ON INOPERATIVE ENGINE

WAC R-1820 968 C9HE2 ENGINES
HAM STD PROPELLER 3 34H4, BLADE 6615A-0
WITH AUTO FEATHERING
FLAPS UP GEAR UP
COWL FLAP SETTING: OPERATING ENGINE +3 DEG
INOPERATIVE ENGINE CLOSED
STANDARD ATMOSPHERIC CONDITIONS
METO ENGINE POWER



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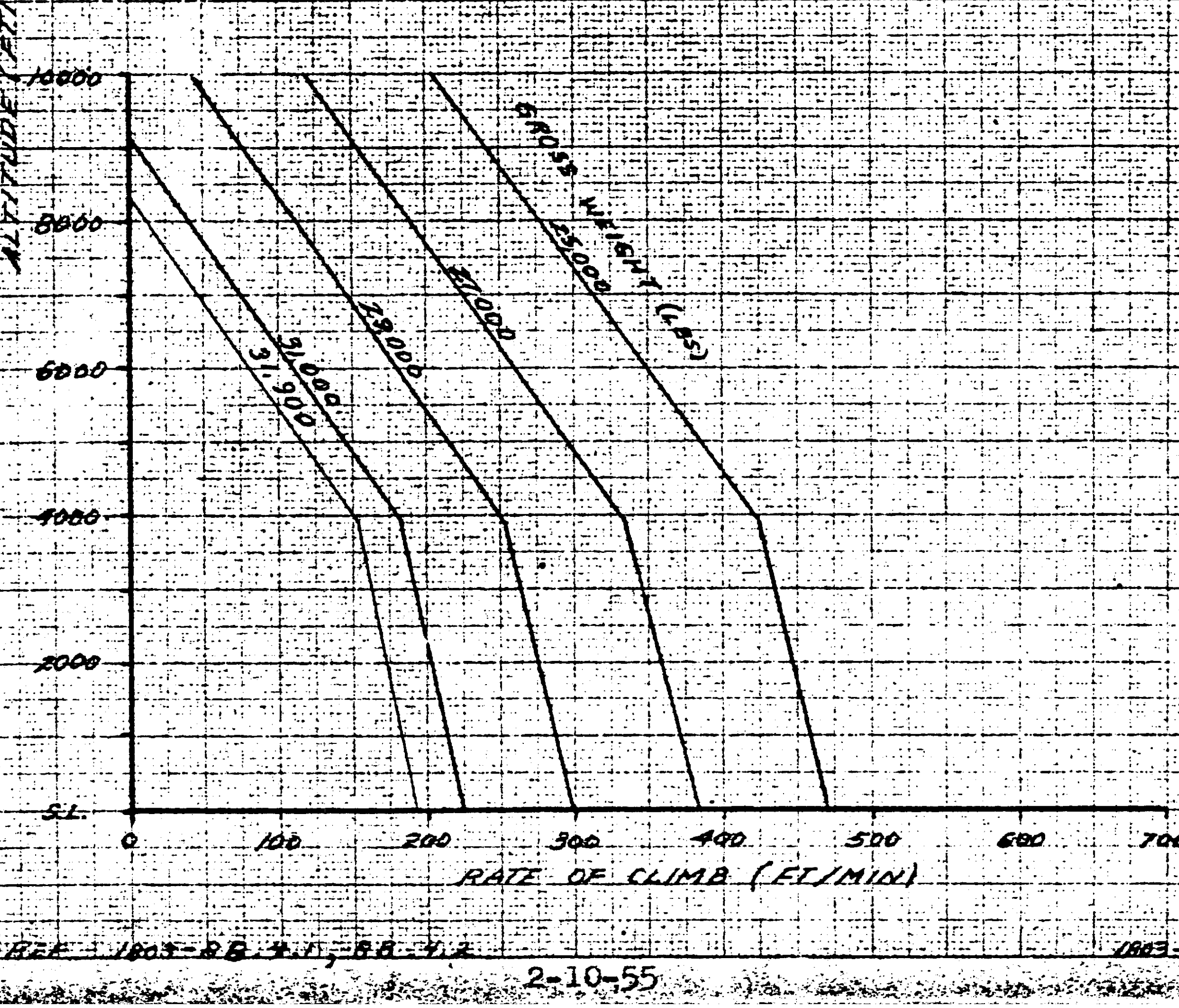
2-10-55

MODEL SUPER DC-3
FOURTH SEGMENT TAKE-OFF CLIMB
PROPELLER FEATHERED ON INOPERATIVE ENGINE

WAC R-1820 968 C9HE-2 ENGINES
HAM. STD PROPELLER 2-3417A, BLADE 6615A-0
WITH AUTO FEATHERING
FLAPS UP GEAR UP
COWL FLAP SETTING: OPERATING ENGINE 16 DEG
INOPERATIVE ENGINE CLOSED
STANDARD ATMOSPHERIC CONDITIONS
METO ENGINE POWER



REF. 1803-BB 4.1, BB 4.2 1803-BB 4.3A

2-10-55

FORM 25 BP

CAA APPROVED

Analysis PERFORMANCE

Prepared by AERODYNAMICS

DOUGLAS AIRCRAFT COMPANY, INC.

Page [illegible]

Model DC-3S

Report No. [illegible]

Date 7-6-50

REVISED 8-11-50, 9-8-54

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MODEL SUPER DC-3

LANDING CLIMB

WAC R-1820 968 C9HE-2 ENGINES

HAM STD PROPELLER J-3417A, BLADE 6615A-0

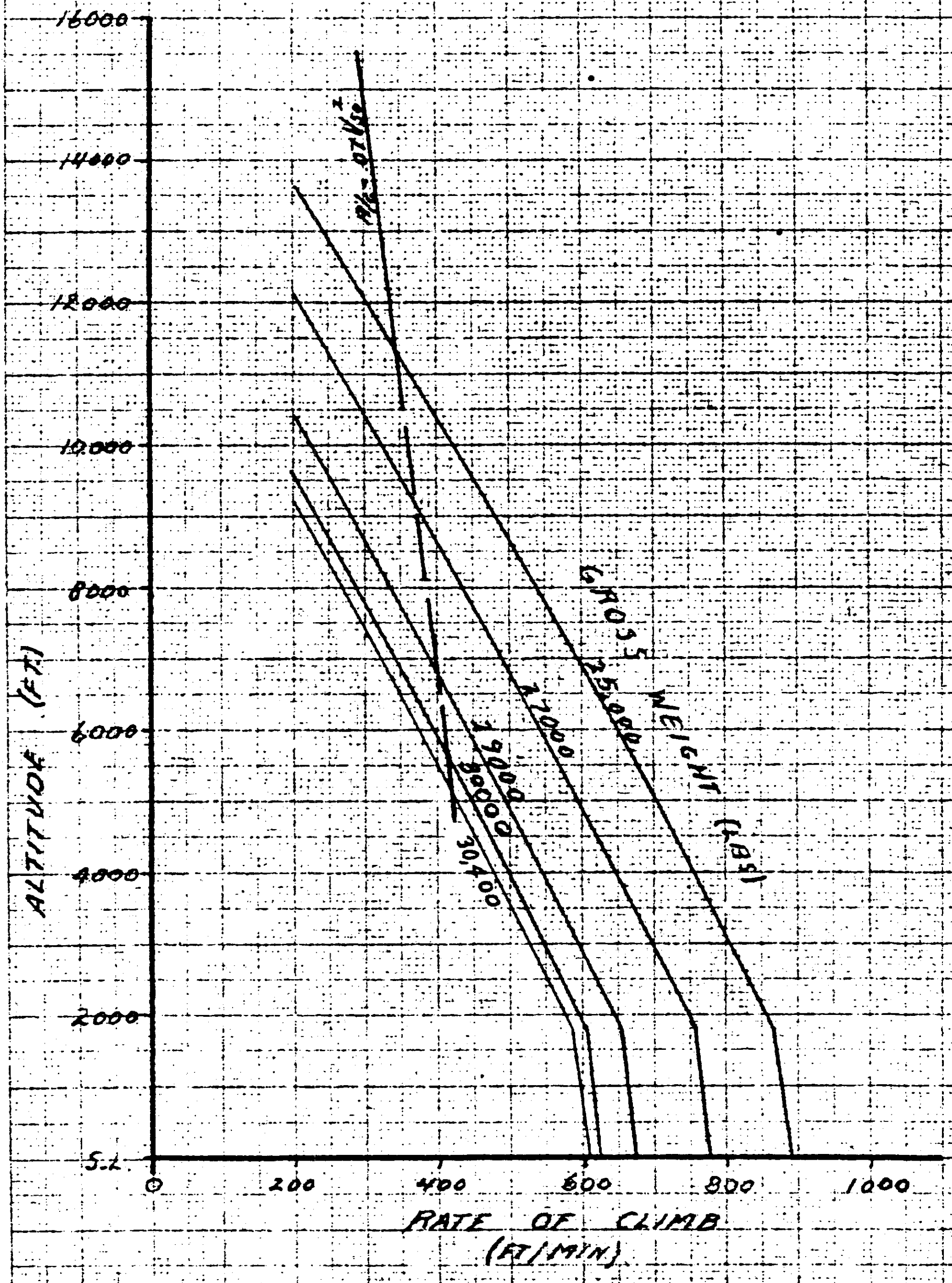
WITH AUTO FEATHERING

FLAPS FULL DOWN GEAR DOWN

COWL FLAP SETTING: BOTH ENGINES +6 DEG

STANDARD ATMOSPHERIC CONDITIONS

TAKE-OFF ENGINE POWER



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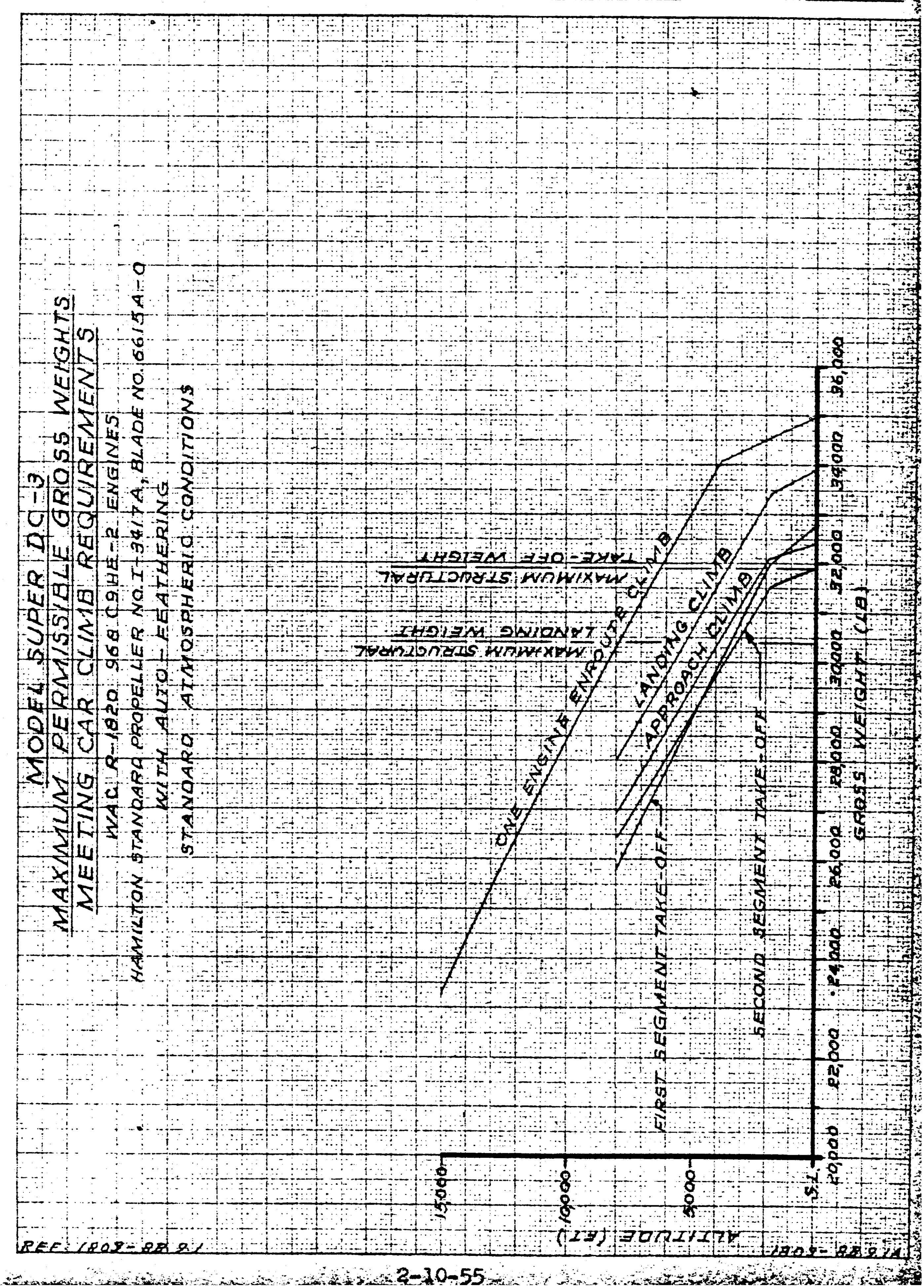


MODEL SUPER DC-3
MAXIMUM PERMISSIBLE GROSS WEIGHTS
MEETING CAR CLIMB REQUIREMENTS
WAC R-1820 968 C9HE-2 ENGINES
HAMILTON STANDARD PROPELLER NO. I-3417A, BLADE NO. 6615A-0
WITH AUTO-FEATHERING
STANDARD ATMOSPHERIC CONDITIONS

REF. 1809-88.9.1

1809-88.9.1A

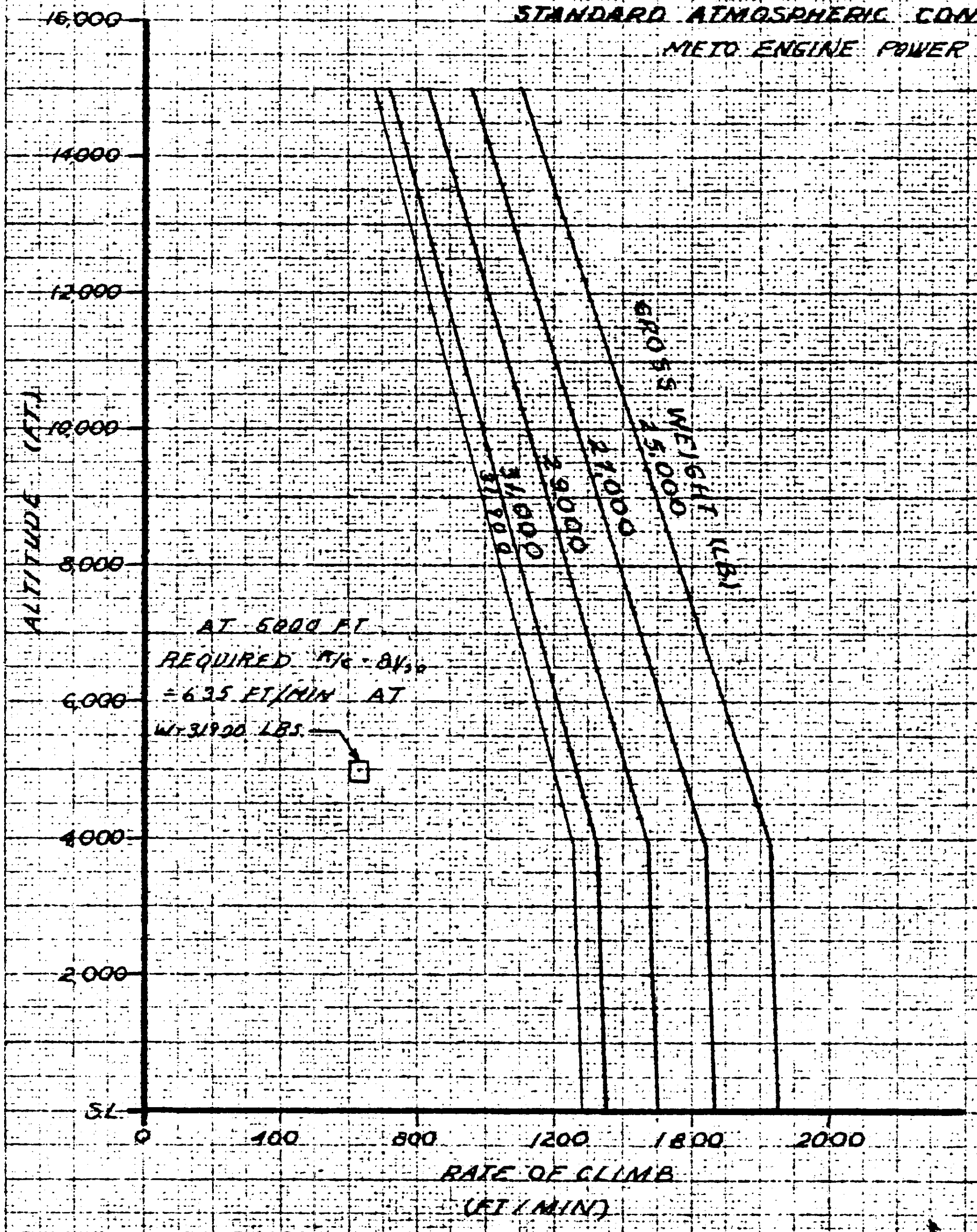
2-10-55

MODEL SUPER DC-3
TWO ENGINE ENROUTE CLIMB

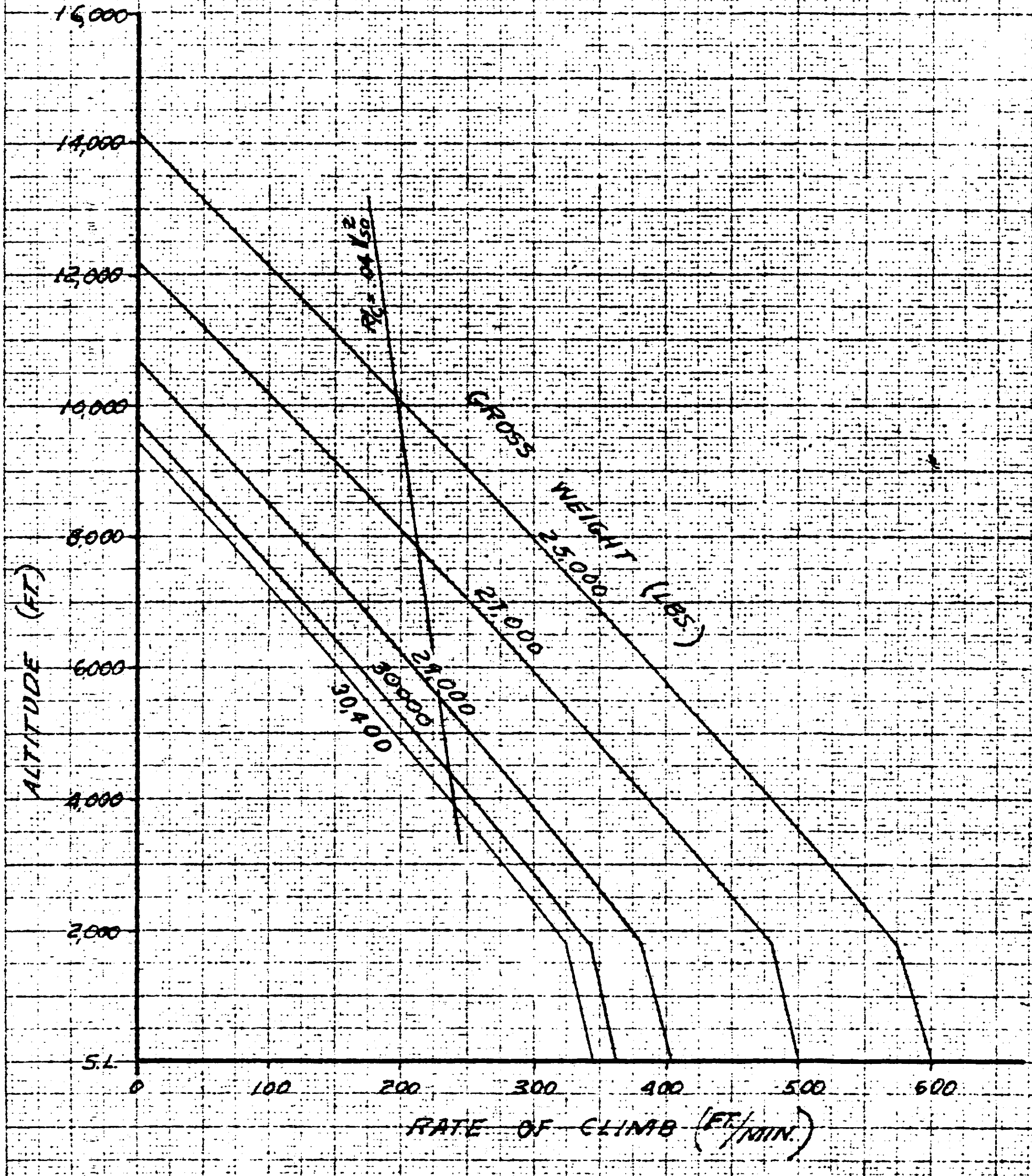
WAC R-1820 96B 9CHE-2 ENGINES
HAM. STD. PROPELLER I-3417A-0, BLADE 6615A-0
WITH AUTO FEATHERING

○ (REQUIRED R/C = $6V_{s}$ = 476 FT/MIN
AT W = 31,900 LB.)

FLAPS UP GEAR UP
COWL FLAP SETTING: BOTH ENGINES + 6 DEG.
STANDARD ATMOSPHERIC CONDITIONS
METO ENGINE POWER



MODEL SUPER DC-3
APPROACH CLIMB
PROPELLER FEATHERED ON INOPERATIVE ENGINE
WAC R-1820-96B C9HE-2 ENGINES
HAM STD PROPELLER I-3417A, BLADE 6615A-0
WITH AUTO FEATHERING
FLAPS 11.5 DEG DOWN GEAR UP
COWL FLAP SETTING: OPERATIVE ENGINE +6 DEG
INOPERATIVE ENGINE CLOSED
STANDARD ATMOSPHERIC CONDITIONS
TAKE-OFF ENGINE POWER



REF: 1803-8B.7.1, 1803-8B.7.2

2-10-55

EXAMPLE: FOR THE USE OF TAKE-OFF PERFORMANCE CHARTS

GIVEN:

TAKE-OFF GROSS WEIGHT	(LB)	29,000
ALTITUDE	(FT)	3,400
REPORTED HEADWIND SPEED AT 50 FT. HEIGHT	(MPH)	20
RUNWAY SLOPE	(UPHILL)	+1%
TEMPERATURE	(ABOVE STANDARD)	33°F.

FIND: MINIMUM TAKE-OFF RUNWAY LENGTH WITH ZERO SLOPE AT STANDARD CONDITIONS AND 20 MPH HEADWIND

On chart of Minimum Take-Off Runway Length, page 104, go vertically up the 3,400 ft. altitude line to 29,000 lbs. gross weight line. From intersection go horizontally left to vertical line of 20 mph reported headwind speed at a 50 ft. height

READ: 4,110 ft. = minimum take-off runway length with zero slope and standard condition for 20 mph headwind.

FIND: MINIMUM TAKE-OFF RUNWAY LENGTH WITH ZERO SLOPE AT +33°F. ABOVE STANDARD CONDITIONS

Find the minimum take-off runway length for zero runway slope at standard conditions as described above.

From page 129 add 10 ft./°F. to the minimum take-off runway length for each degree above standard.

+33°F. x 10 ft/°F. = +330 ft.

Minimum take-off runway length with zero slope at +33°F. above standard conditions with 20 mph headwind = 4,110 + 330 = 4,440 ft.

FIND: MINIMUM TAKE-OFF RUNWAY LENGTH WITH +1% (UPHILL) SLOPE AND TEMPERATURE 33°F. ABOVE STANDARD

Find the minimum take-off runway length with zero slope at 33°F. above standard as described above. On chart of Effect of Runway Slope on the Minimum Take-Off Runway Length, page 119, go vertically up the 4,440 ft. take-off runway length with zero slope line to the +.01 runway slope line. From intersection go horizontally left and read take-off runway length with slope = 5,780 ft.

FIND: CRITICAL ENGINE FAILURE SPEED

Critical engine failure speed at any weight is read from the curve on page 105.

Critical engine failure speed at 29,000 lbs. = 104.7 mph (indicated)

FIND: HEIGHT ABOVE THE 50 FT. HEIGHT AT A DISTANCE OF 9,000 FT. FROM THE 50 FT. HEIGHT AT STANDARD ATMOSPHERIC CONDITIONS

On chart of Minimum Take-Off Runway Length, page 104, read runway length for zero headwind at standard conditons

Minimum take-off runway length = 4,580 ft.

On Take-off Path chart, page 139 enter chart at 20 mph reported headwind at a 50 ft. height and go horizontally to 9,000 ft. distance from a 50 ft. height line. From the intersection go vertically up to the 4,580 ft. minimum take-off runway length with zero wind line. From the intersection read horizontally left to height above a 50 ft. height.

Height above a 50 ft. height = 328 ft.

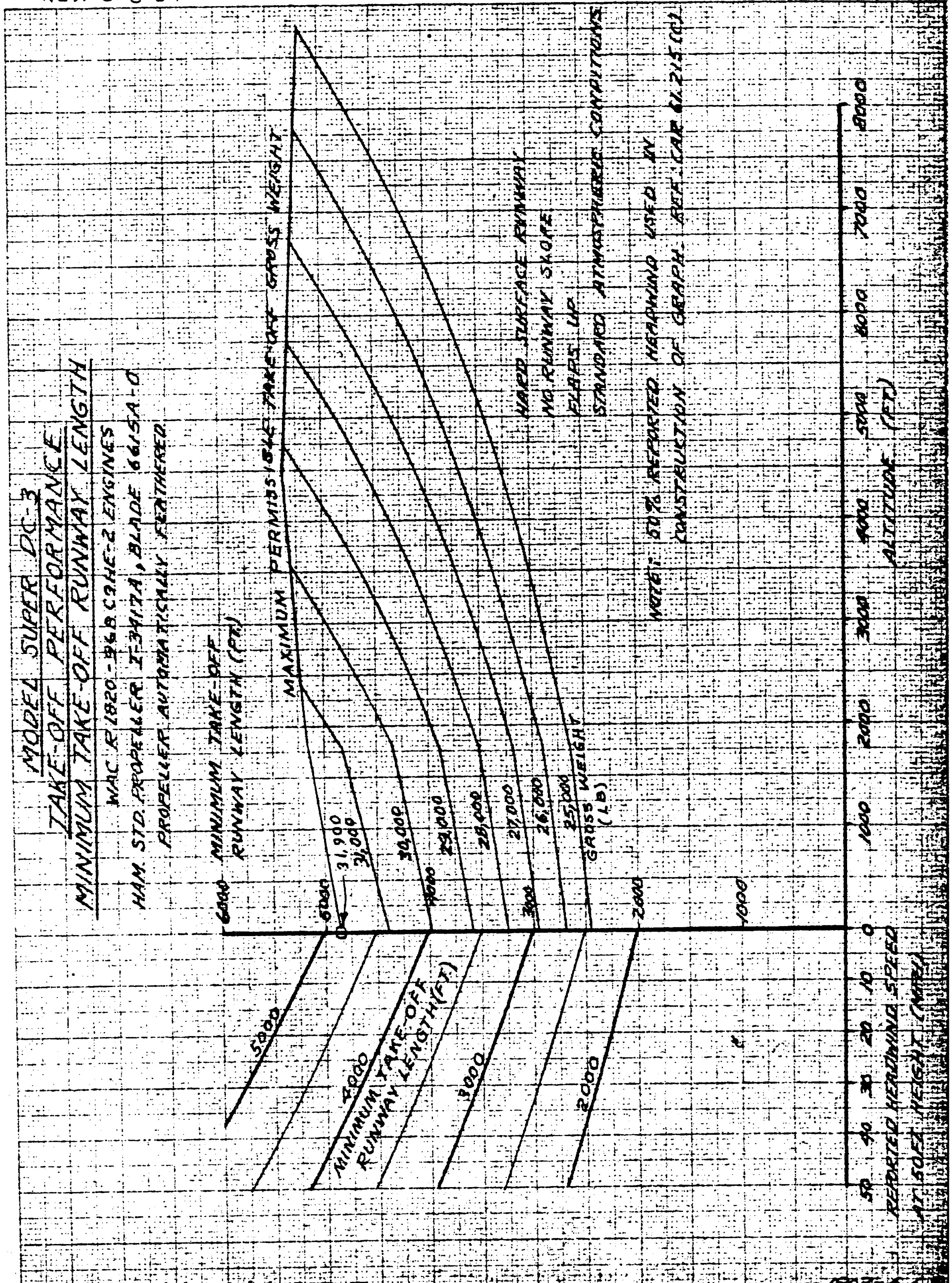
FORM 35 BP

CAA APPROVED

Analysis PERFORMANCE
Prepared by AERODYNAMICS
Date 7-6-50
REV. 9-8-54

DOUGLAS AIRCRAFT COMPANY, INC.

Page
Model SUPER DC-3
Report No.



MODEL SUPER DC-3
TAKE-OFF PERFORMANCE
MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R1820-56B C9HE-2 ENGINES
HAM. STD. PROPELLER I-3417A, BLADE 6615A-0
PROPELLER AUTOMATICALLY FEATHERED

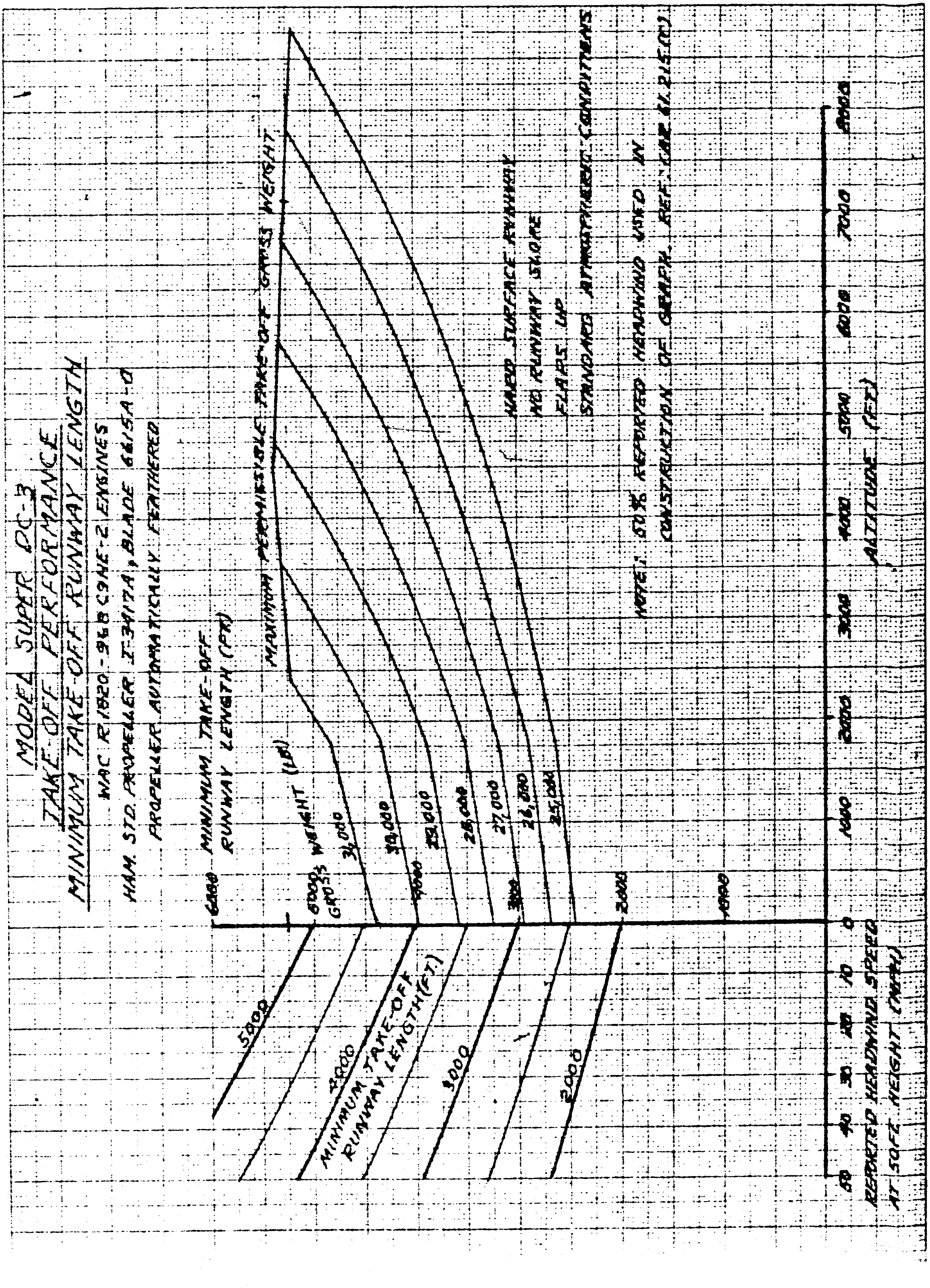
HARD SURFACE RUNWAY
NO RUNWAY SLOPE
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS

NOTE: 50% REPORTED HEADWIND USED IN CONSTRUCTION OF GRAPH. REF. CAR 61.215 (C)

JLD ~~REF: 1803-6.6.3, 6.6.6, 6.6.7~~

2-10-55

1803-6.6



MODEL SUPER DC-3
TAKE-OFF PERFORMANCE
MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R.1820-9&B C9HE-2 ENGINES
HAM. STD. PROPELLER I-3417A, BLADE 6615A-0
PROPELLER AUTOMATICALLY FEATHERED

HARD SURFACE RUNWAY
NO RUNWAY SLOPE
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS

NOTE: 50% REPORTED HEADWIND USED IN CONSTRUCTION OF GRAPH. REF. CAR 41.215(C)

TAKE-OFF PERFORMANCE TEMPERATURE ACCOUNTABILITY

AS PER CAR 4b.98b

TEMPERATURE ACCOUNTABILITY FOR TAKE-OFF GROSS WEIGHT AT CONSTANT TAKE-OFF RUNWAY LENGTH

Correction to gross weight at temperatures above standard = -18 lbs./°F

Correction to gross weight at temperatures below standard = +18 lbs./°F

TEMPERATURE ACCOUNTABILITY FOR MINIMUM TAKE-OFF RUNWAY LENGTH AT CONSTANT TAKE-OFF GROSS WEIGHT

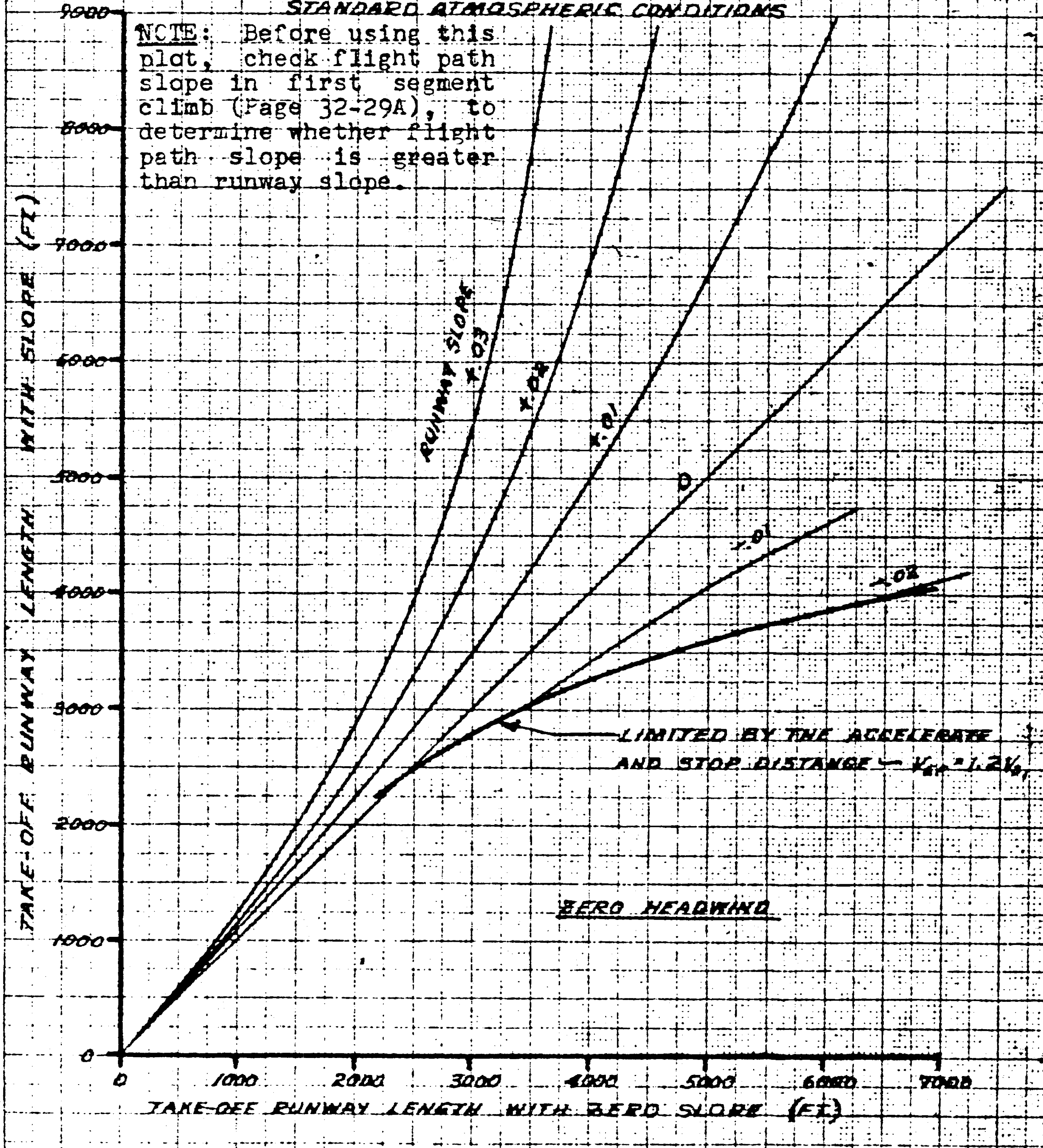
Correction to runway length at temperatures above standard = +10 ft./°F

Correction to runway length at temperatures below standard = -7 ft./°F

True Indicated Critical Engine Failure Speed is unaffected temperature.

MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R-1820 968C9HE-2 ENGINES
HAM STD PROPELLER I-3417A, 6615A-0 BLADES
WITH AUTO FEATHERING
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS

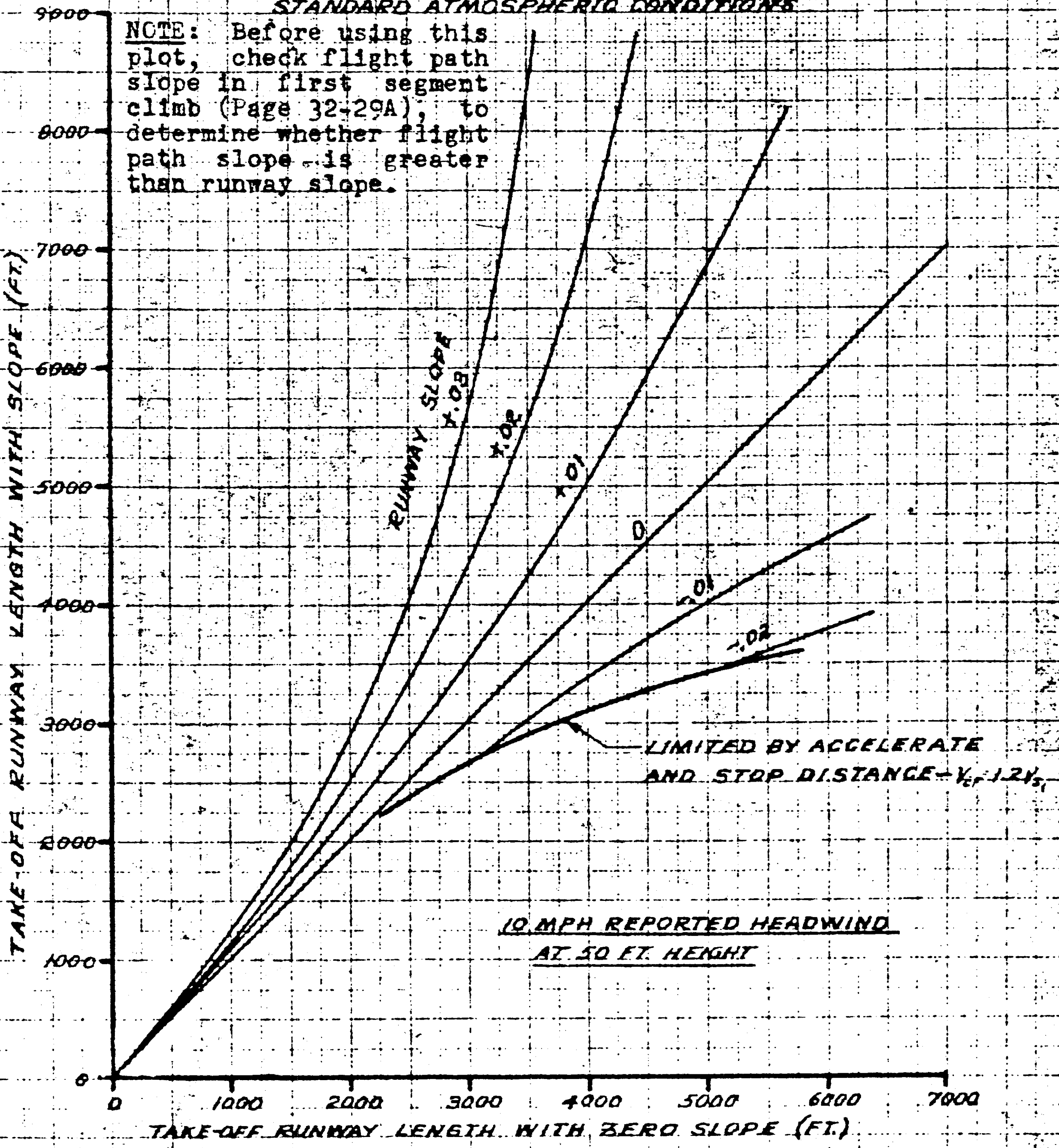


NOTE: Before using this plot, check flight path slope in first segment climb (Page 32-29A), to determine whether flight path slope is greater than runway slope.

Rev. 7-24-51

MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R-1820 968 C9HE-2 ENGINES
HAM. STD PROPELLER I-3417A, 6615A-0 BLADES
WITH AUTO FEATHERING
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS

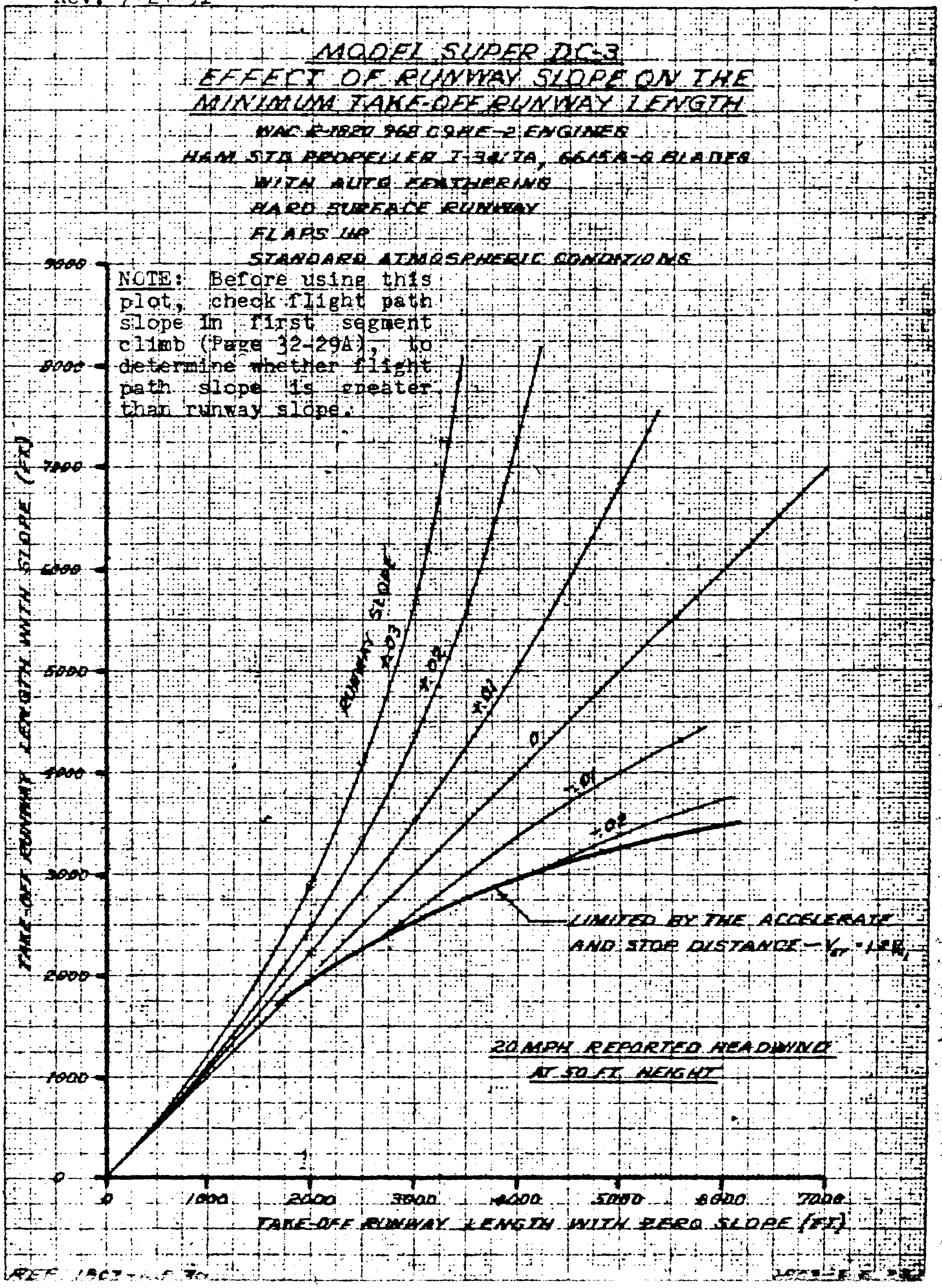


NOTE: Before using this plot, check flight path slope in first segment climb (Page 32-29A), to determine whether flight path slope is greater than runway slope.

ID REF: 803-6.8.30 1803-6.8.32

119

Rev. 7-24-51



MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE
MINIMUM TAKE-OFF RUNWAY LENGTH

~~WAC R-1820 968 C9HE-2 ENGINES~~
HAM STD PROPELLER 7-34/7A, 6615A-6 BLADES
WITH AUTO FEATHERING
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS

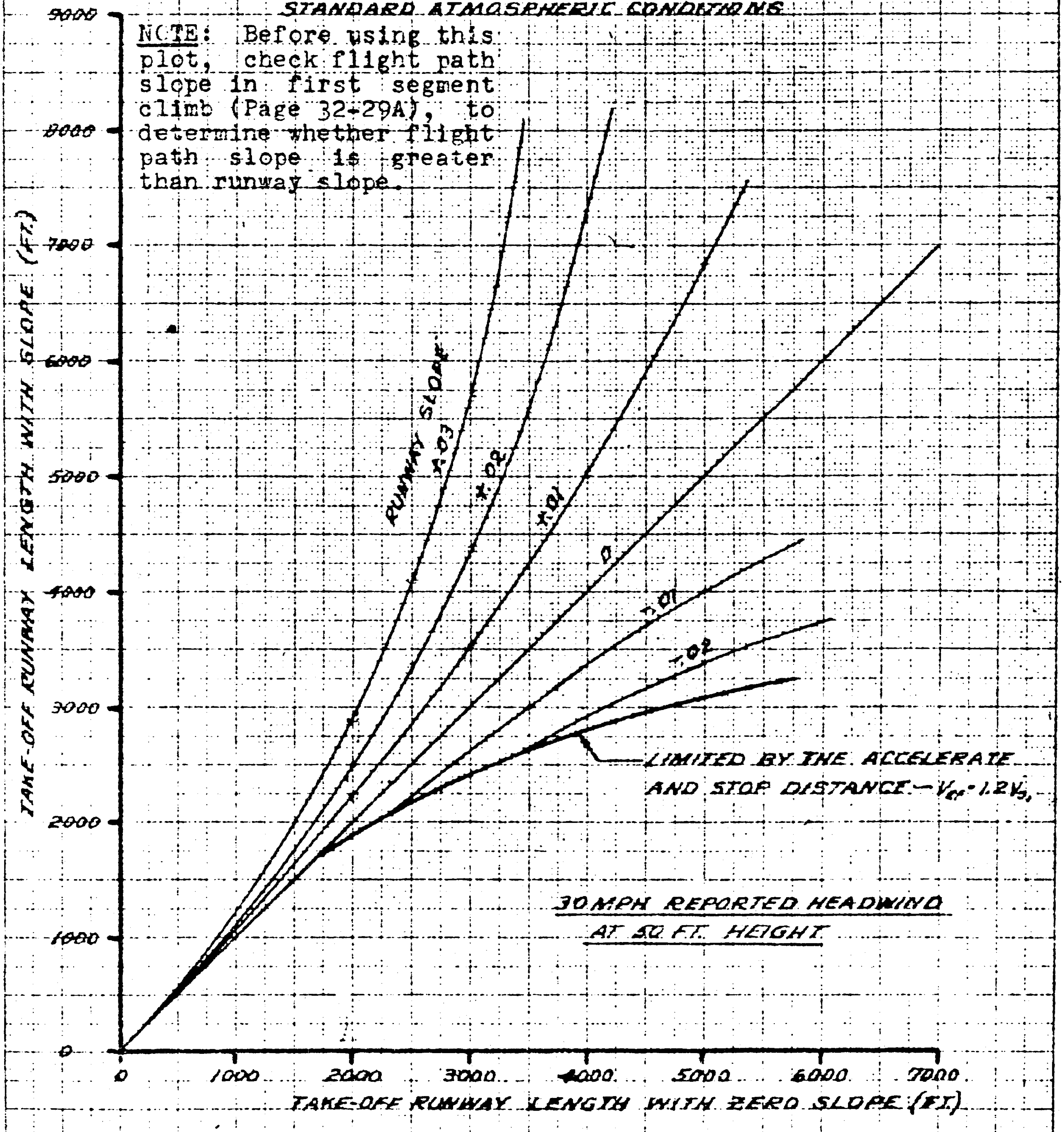
NOTE: Before using this plot, check flight path slope in first segment climb (Page 32-29A), to determine whether flight path slope is greater than runway slope.

20 MPH REPORTED HEADWIND
AT 50 FT. HEIGHT

Rev. 7-24-51

MODEL SUPER D.C-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R-1820 968 C9HE-2 ENGINES
HAM STD PROPELLER 1-3417A, 6615A-0 BLADES
WITH AUTO FEATHERING
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS

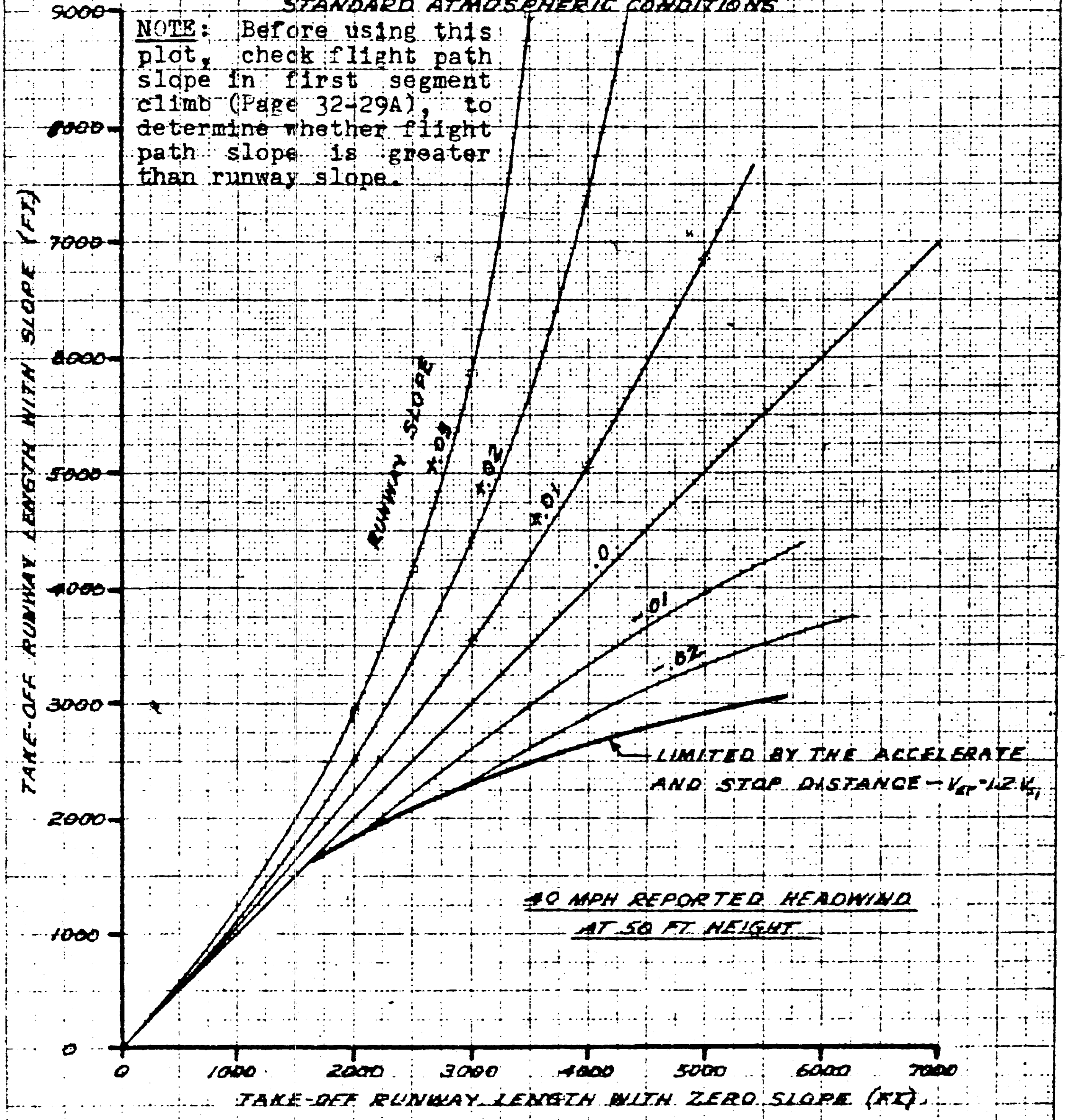


NOTE: Before using this plot, check flight path slope in first segment climb (Page 32-29A), to determine whether flight path slope is greater than runway slope.

Rev. 7-24-51

MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R-1820 968 C9HE-2 ENGINES
HAM STD PROPELLER I-3417A, 6615A-0 BLADES
WITH AUTO FEATHERING
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS



NOTE: Before using this plot, check flight path slope in first segment climb (Page 32-29A), to determine whether flight path slope is greater than runway slope.

40 MPH REPORTED HEADWIND AT 50 FT. HEIGHT

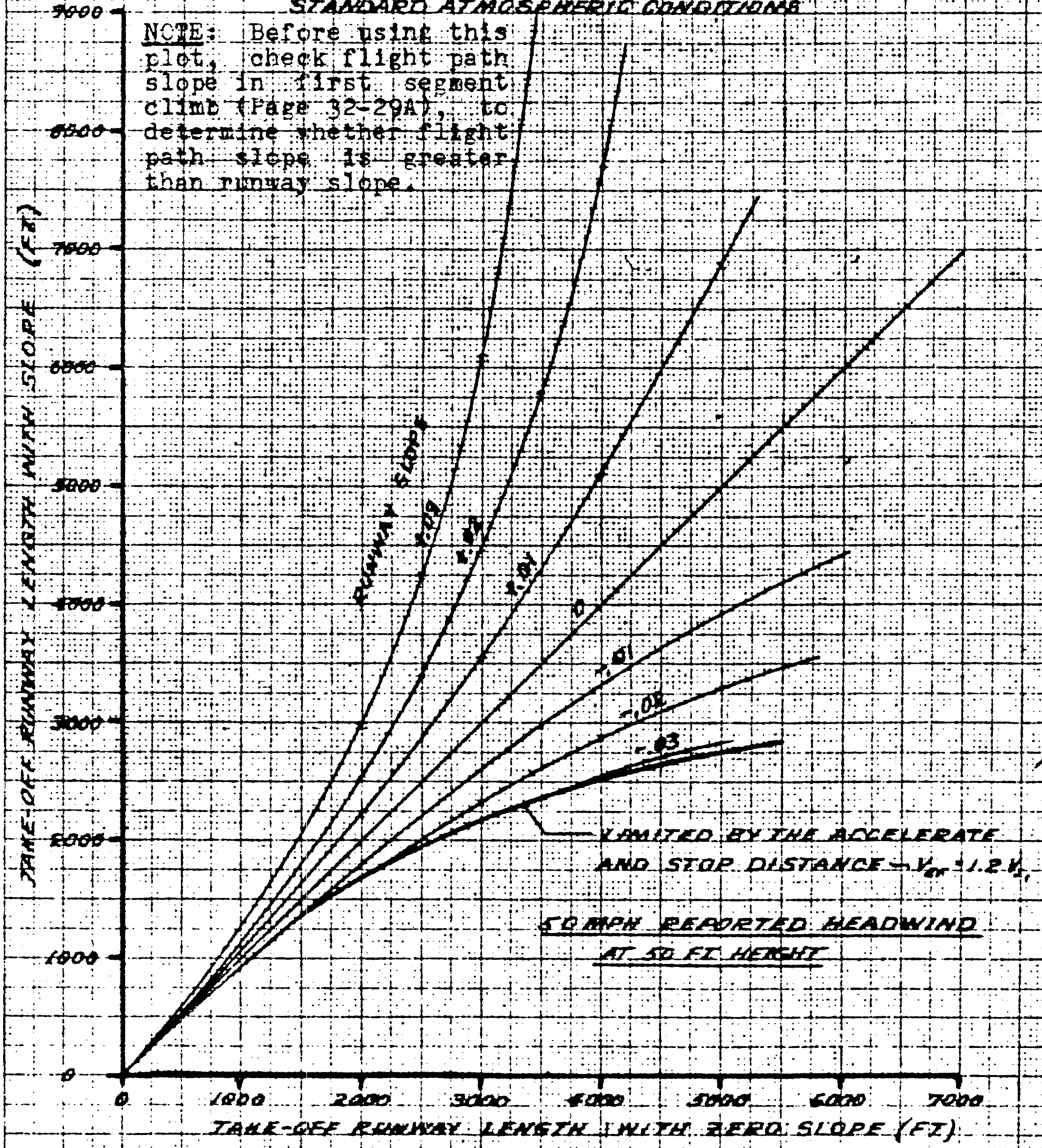
D REF. 1803-6.B 30.

1803-6.P 34

Rev. 7-24-51

MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R-1820 968 C9HE-2 ENGINES
HAM. STD. PROPELLER I-3419A, 6615A-0 BLADES
WITH AUTO FEATHERING
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS



NOTE: Before using this plot, check flight path slope in first segment climb (Page 32-29A), to determine whether flight path slope is greater than runway slope.

LIMITED BY THE ACCELERATE AND STOP DISTANCE – $V_{CR} = 1.2 V_{1}$

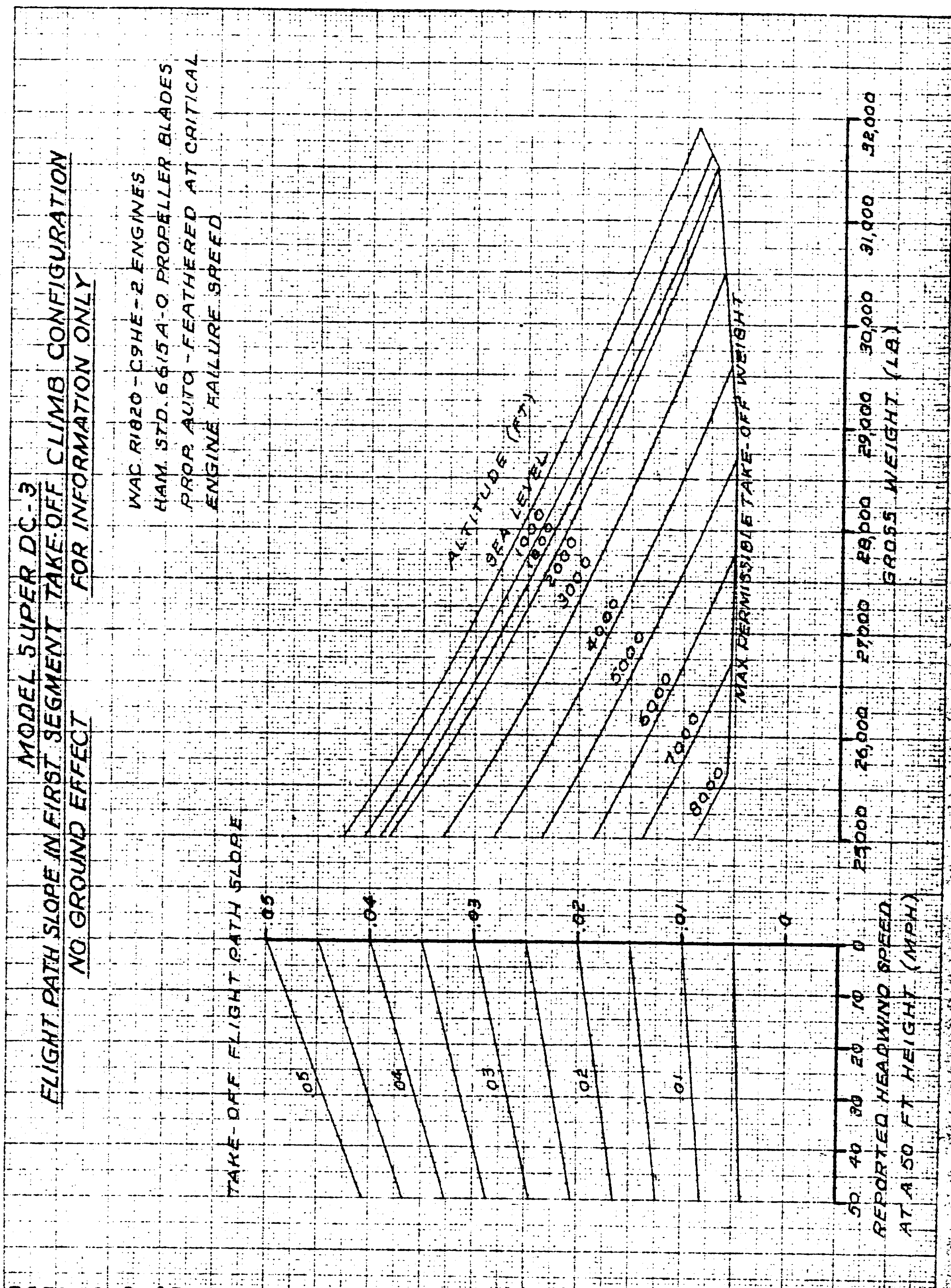
50 MPH REPORTED HEADWIND AT 50 FT HEIGHT

W.D. REF: 1803-L.P. 30

1803-L.P. 35

MODEL SUPER DC-3
FLIGHT PATH SLOPE IN FIRST SEGMENT TAKE-OFF CLIMB CONFIGURATION
NO GROUND EFFECT FOR INFORMATION ONLY

WAC R1820-C9HE-2 ENGINES
HAM. STD. 6615A-0 PROPELLER BLADES
PROP. AUTO-FEATHERED AT CRITICAL
ENGINE FAILURE SPEED



REF: 1803-8B1181I, -8B120A

1803-8B1120C

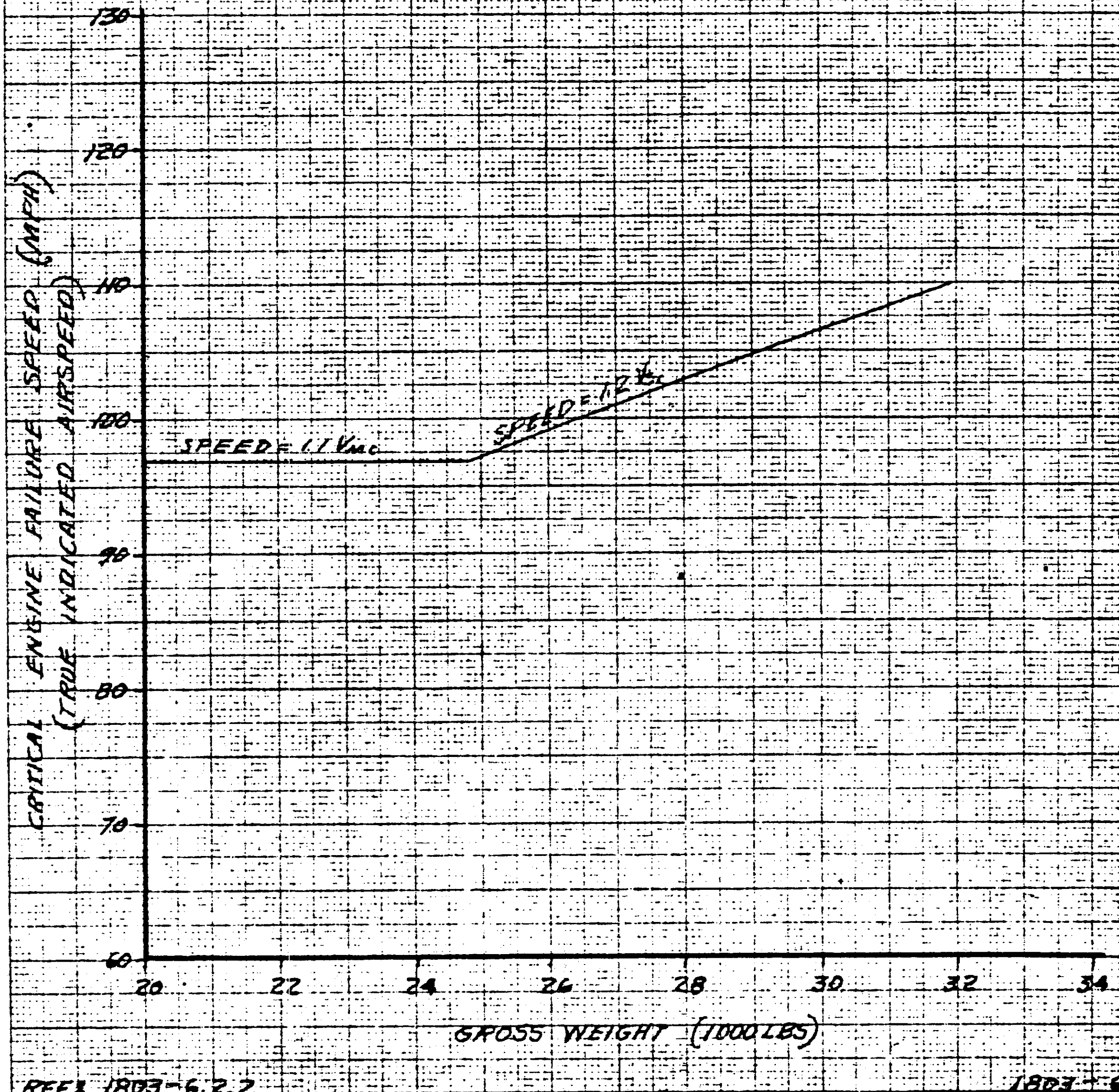
2-10-55

MODEL SUPER DC-3
TAKE-OFF PERFORMANCE
TRUE INDICATED CRITICAL ENGINE FAILURE SPEED

HAM STD PROPELLER I-3417A, BLADE 6615A-0

APPLICABLE TO ALL WIND, SLOPE & ATMOSPHERIC CONDITIONS

FLAPS IN TAKE-OFF POSITION (0°)



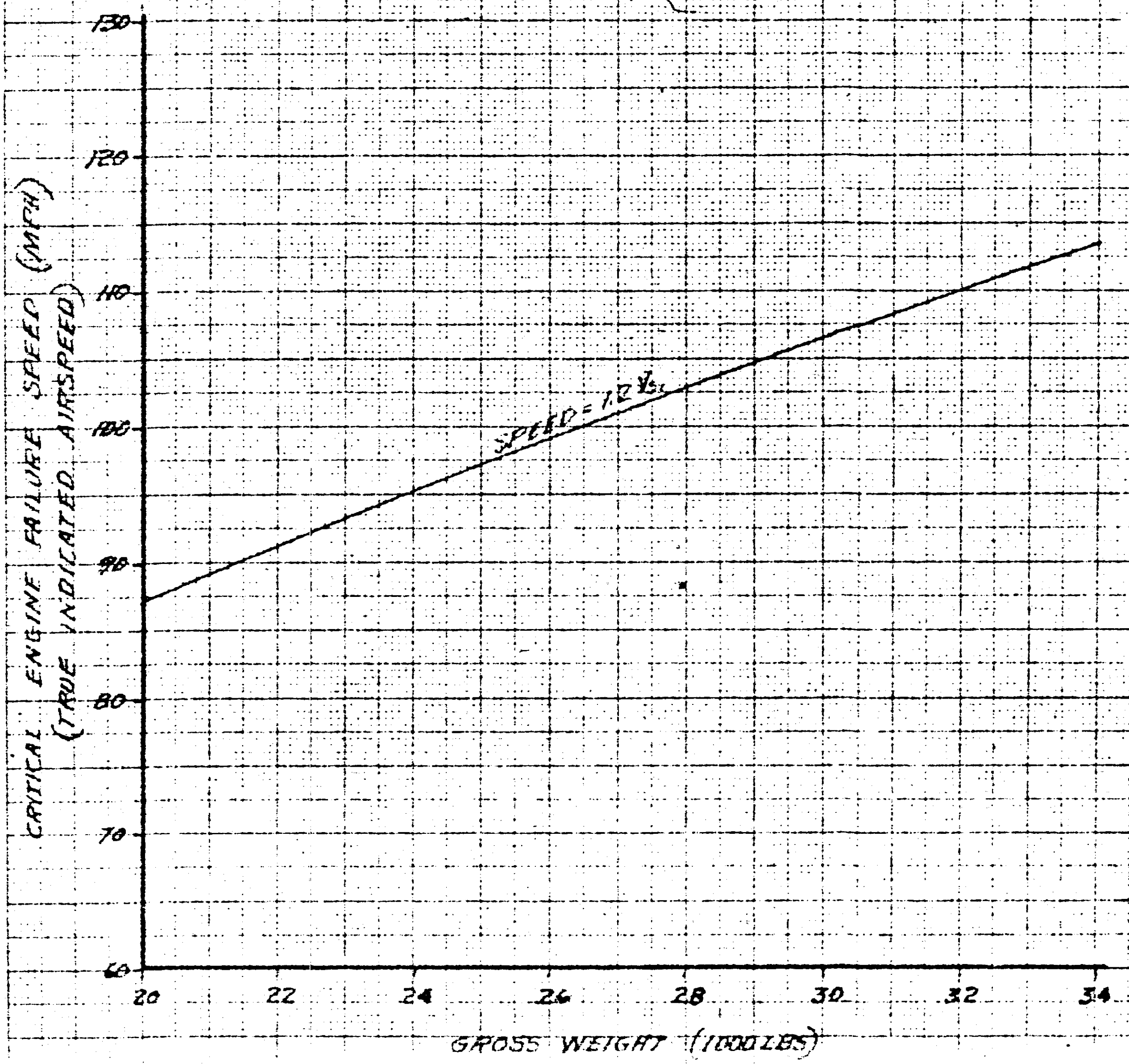
REF: 1803-6.2.2

MODEL SUPER DC-3
TAKE-OFF PERFORMANCE
TRUE INDICATED CRITICAL ENGINE FAILURE SPEED

HAM STD PROPELLER I-3417A, BLADE 6C15A-0

APPLICABLE TO ALL WIND, SLOPE & ATMOSPHERIC CONDITIONS

FLAPS IN TAKE-OFF POSITION (0°)



EXAMPLE: FOR THE USE OF LANDING PERFORMANCE CHARTS

GIVEN:	LANDING GROSS WEIGHT	30,000 LB.
	ALTITUDE	3,400 FT.
	REPORTED HEADWIND SPEED AT 50 FT. HEIGHT	7 MPH

FIND: LANDING DISTANCE FROM 50 FT. HEIGHT

On page go vertically up the 3,400 ft. altitude line to 30,000 lb. gross weight line. From intersection go horizontally left to vertical line of 7 mph reported headwind speed at 50 ft. height.

Read: 1,810 ft. = landing distance from 50 ft. height.

FIND: MINIMUM EFFECTIVE LANDING RUNWAY LENGTH FOR INTENDED DESTINATION (LANDING DISTANCE = 60% RUNWAY LENGTH)

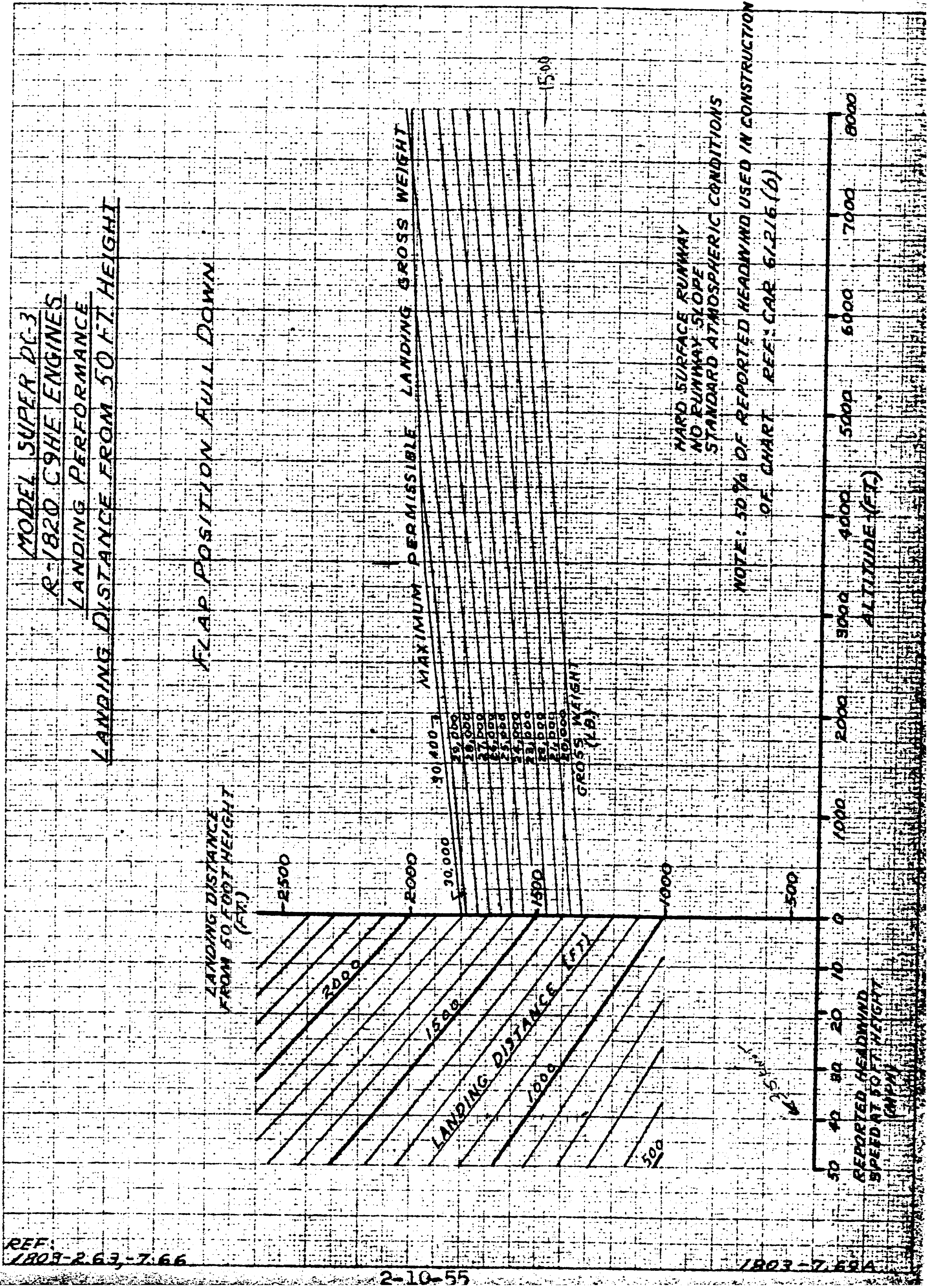
On page go vertically up the 3,400 ft. altitude line to 30,000 lb. gross weight line. From intersection go horizontally left to vertical line of 7 mph reported headwind speed at 50 ft. height.

Read: 3,020 ft. = minimum landing runway length.

FIND: MINIMUM EFFECTIVE LANDING RUNWAY LENGTH FOR ALTERNATE DESTINATION (LANDING DISTANCE = 70% RUNWAY LENGTH)

On page go vertically up the 3,400 ft. altitude line to 30,000 lb. gross weight line. From intersection go horizontally left to vertical line of 7 mph reported headwind speed at 50 ft. height.

Read: 2,590 ft. = minimum landing runway length.



MODEL SUPER DC-3
R-1820 C9HE ENGINES
LANDING PERFORMANCE
LANDING DISTANCE FROM 50 FT. HEIGHT

FLAP POSITION FULL DOWN

HARD SURFACE RUNWAY
NO RUNWAY SLOPE
STANDARD ATMOSPHERIC CONDITIONS

NOTE: 50% OF REPORTED HEADWIND USED IN CONSTRUCTION OF CHART REF: CAR 61.216 (b)

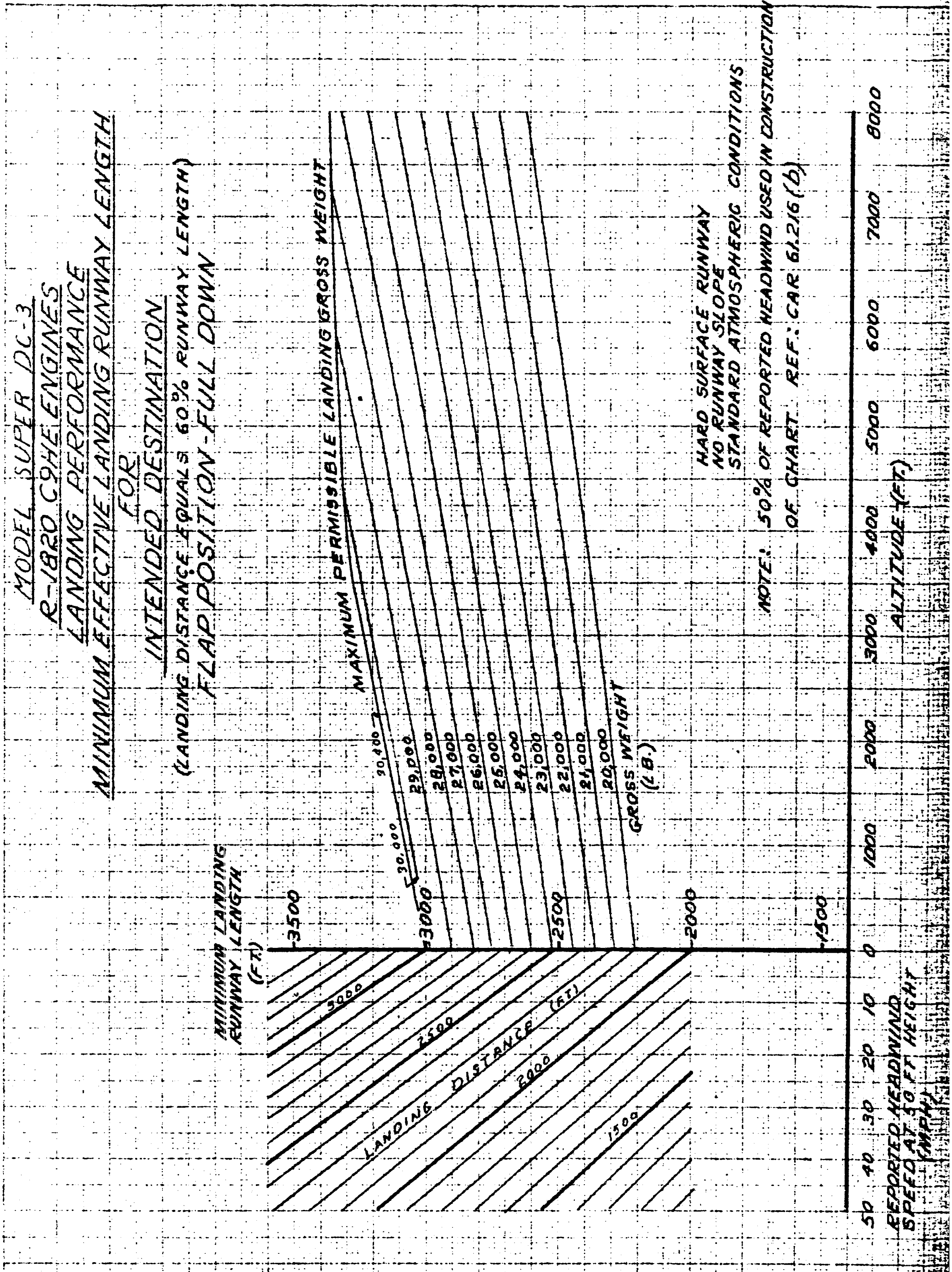
REF:
1803-2.63, -7.66

1803-7.69A

2-10-55

D8

REV. 9-8-54



MODEL SUPER DC-3
R-1820 C9HE ENGINES
LANDING PERFORMANCE
MINIMUM EFFECTIVE LANDING RUNWAY LENGTH
FOR
INTENDED DESTINATION

(LANDING DISTANCE EQUALS 60% RUNWAY LENGTH)

FLAP POSITION - FULL DOWN

HARD SURFACE RUNWAY
NO RUNWAY SLOPE
STANDARD ATMOSPHERIC CONDITIONS

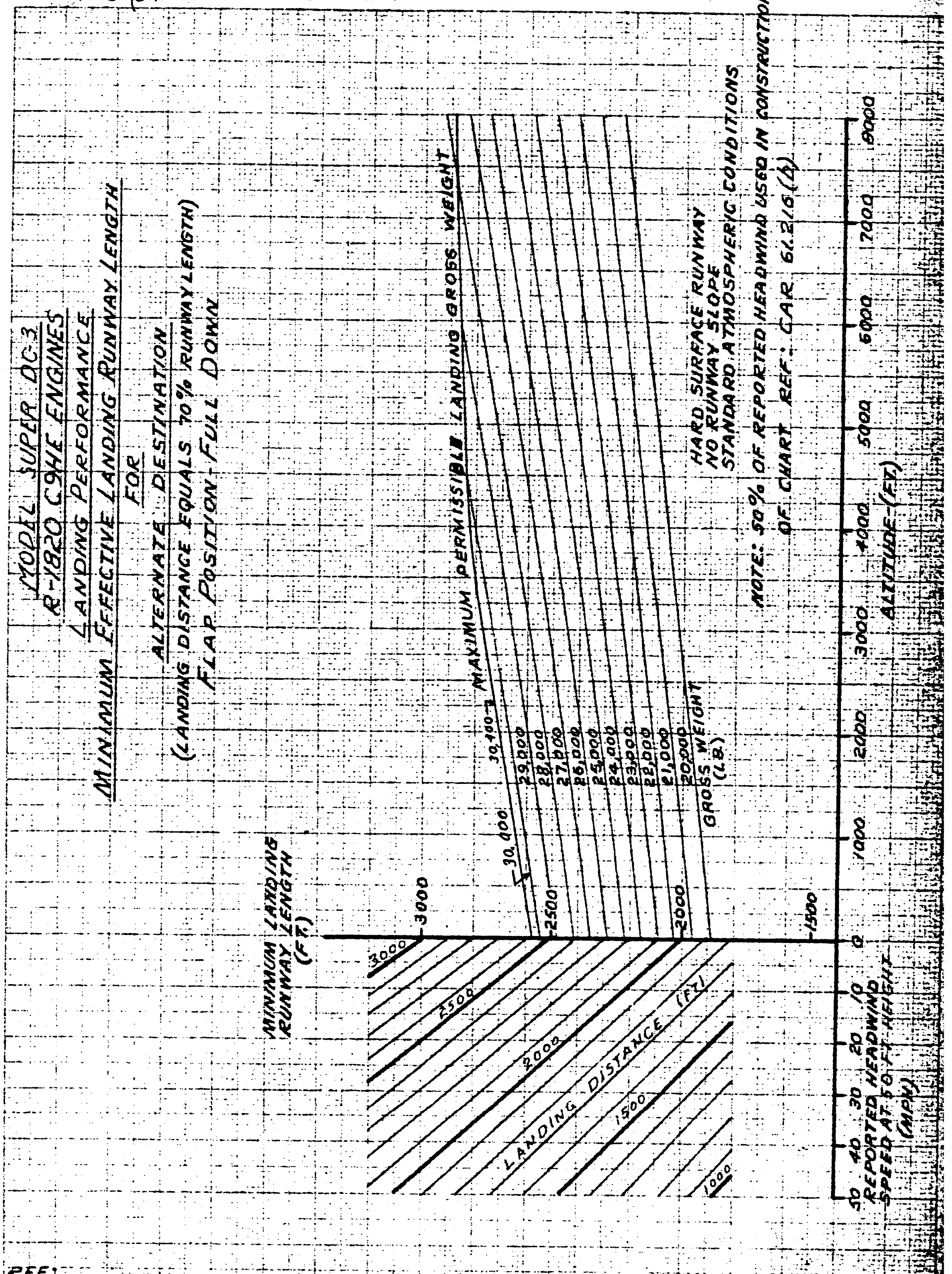
NOTE: 50% OF REPORTED HEADWIND USED IN CONSTRUCTION OF CHART. REF: CAR 61.216 (b)

REF: 1803-764,-767

1803-7.70A

2-10-55

18



MODEL SUPER DC-3
R-1820 C9HE ENGINES
LANDING PERFORMANCE
MINIMUM EFFECTIVE LANDING RUNWAY LENGTH
FOR
ALTERNATE DESTINATION
(LANDING DISTANCE EQUALS 70% RUNWAY LENGTH)
FLAP POSITION-FULL DOWN

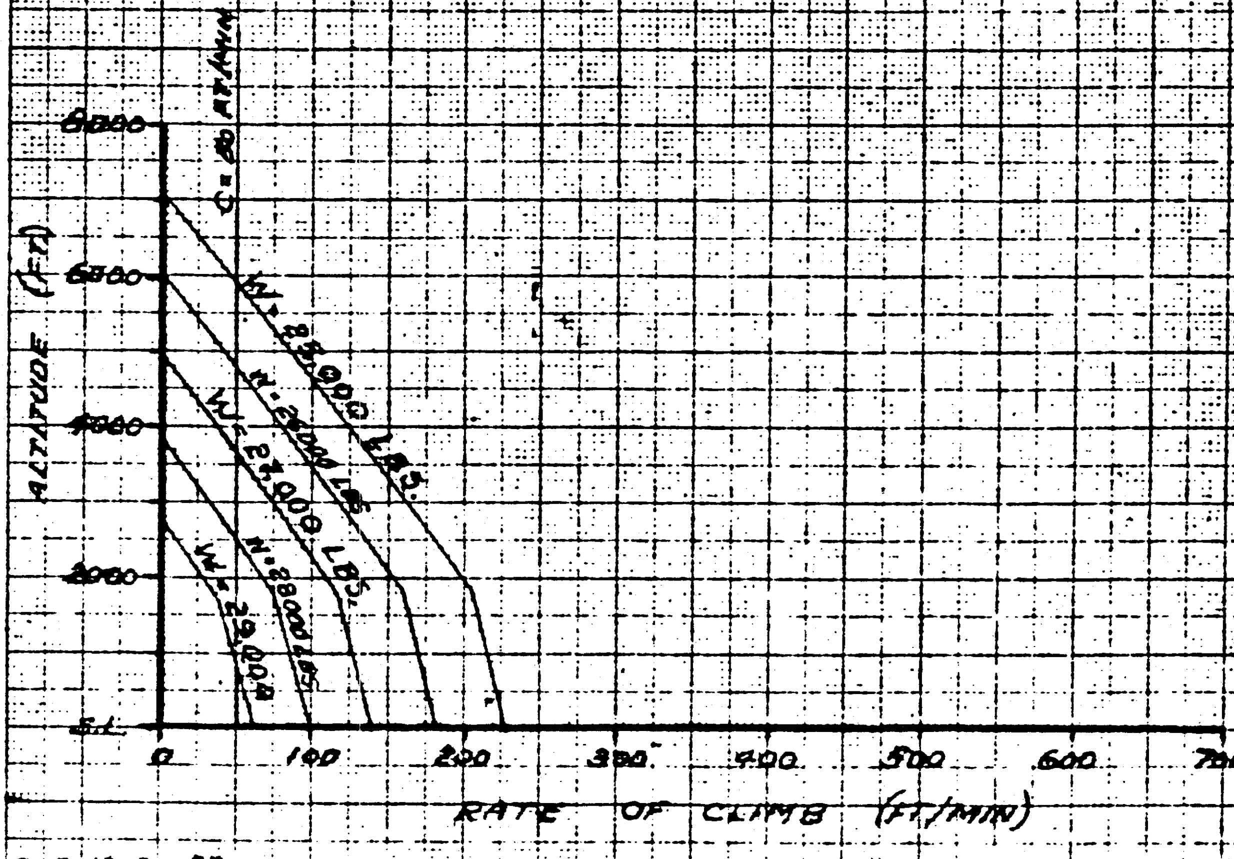
HARD SURFACE RUNWAY
NO RUNWAY SLOPE
STANDARD ATMOSPHERIC CONDITIONS

NOTE: 50% OF REPORTED HEADWIND USED IN CONSTRUCTION OF CHART REF: CAR 61.216(b)

REF:
1803-765-768

MODEL SUPER DC-3
FIRST SEGMENT TAKE-OFF CLIMB
PROPELLER WINDMILLING ON INOPERATIVE ENGINE

WAC R-1820 968 C9HE-2 ENGINES
HAM STD PROPELLER T-33A7A ; BLADE 6615A-0
WITH MANUAL FEATHERING
FLAPS UP GEAR DOWN
COWL FLAP SETTING : BOTH ENGINES +6 DEG
STANDARD ATMOSPHERIC CONDITIONS
TAKE-OFF ENGINE POWER



REF- 1803A-BB : BB.13

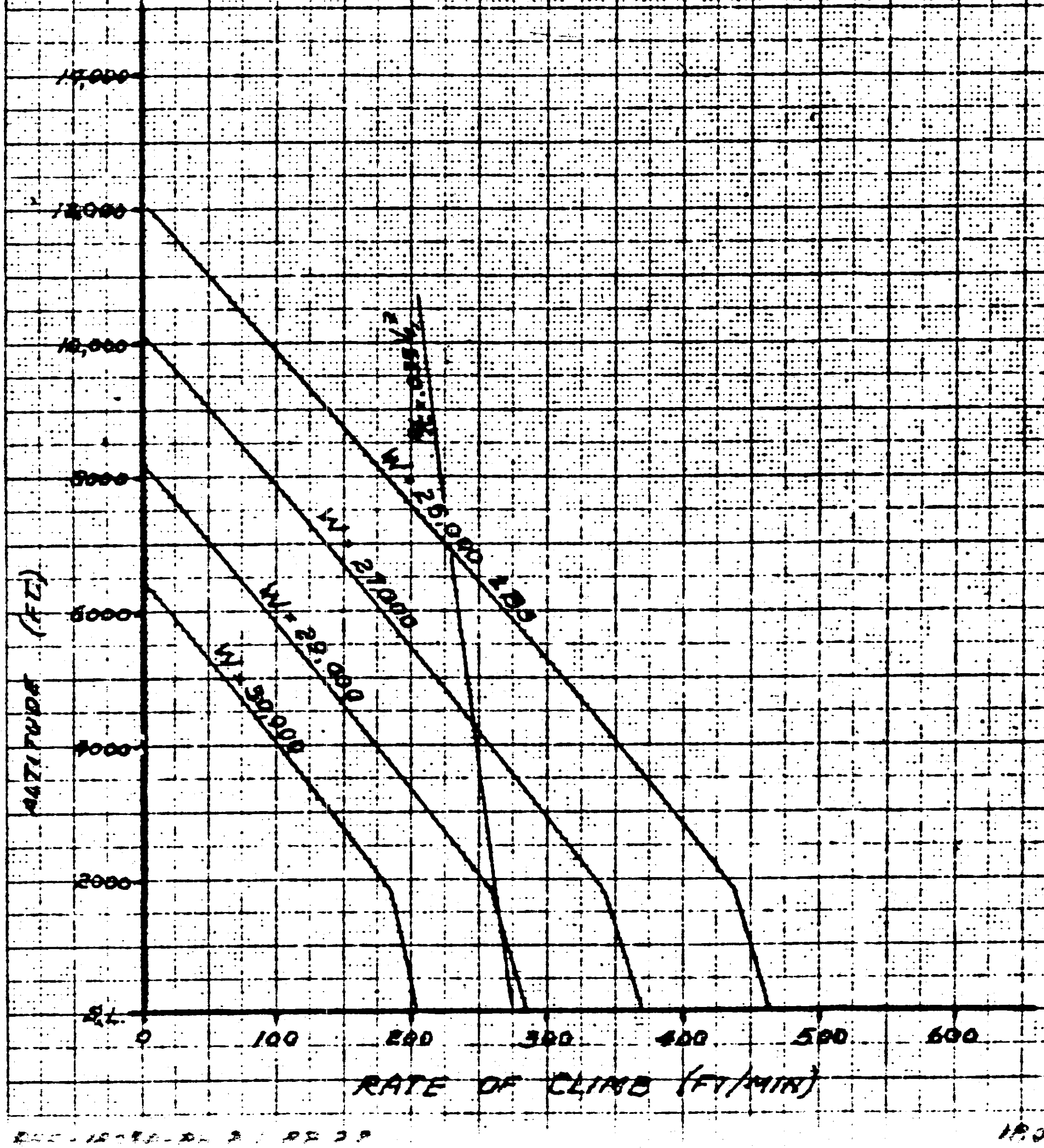
1803A-BB.13

MODEL SUPER DC-3

SECOND SEGMENT TAKE-OFF CLIMB

PROPELLER WINDMILLING ON INOPERATIVE ENGINE

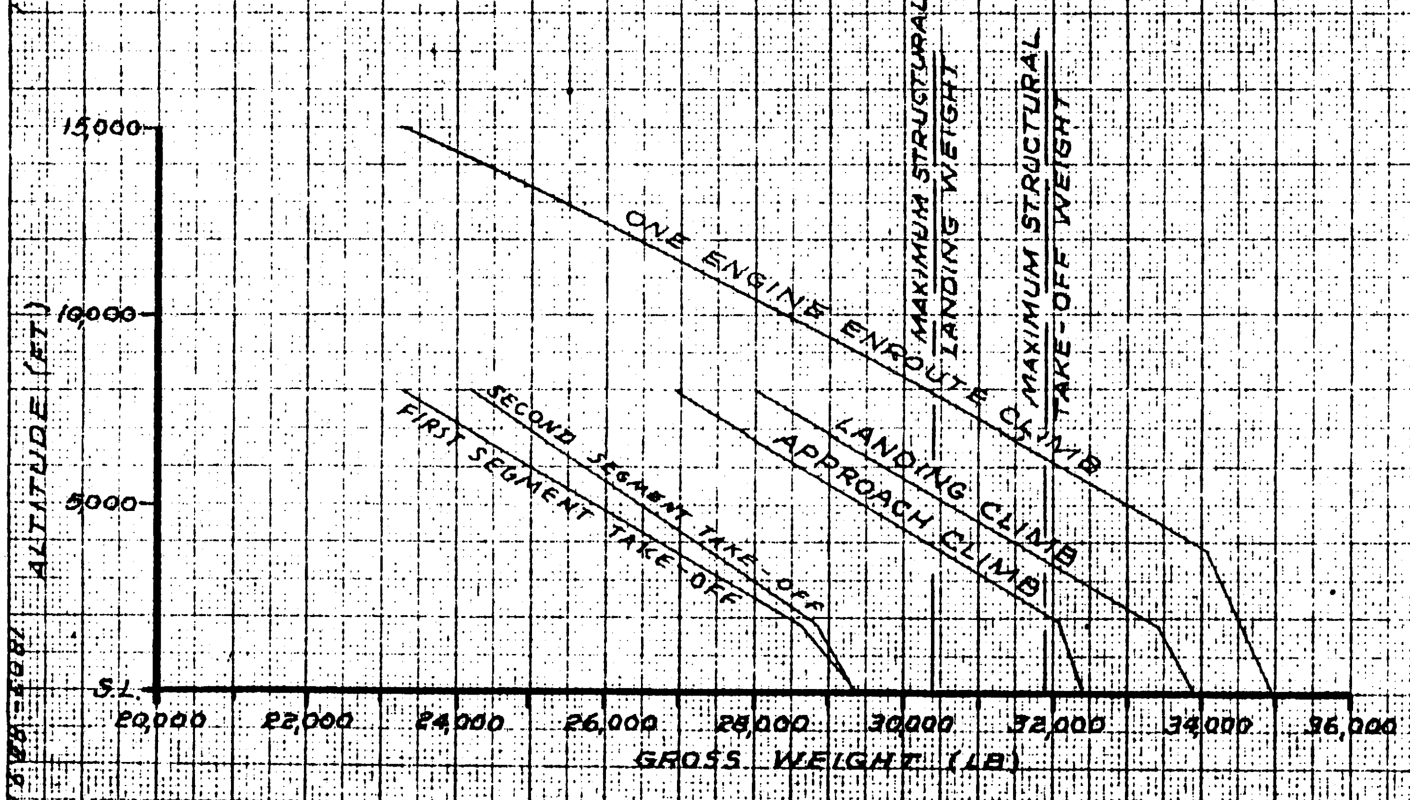
WAC R-1820 96B C9HE-2 ENGINES
HAM STD PROPELLER 3-34174, BLADE 6615A-0
WITH MANUAL FEATHERING
FLAPS UP GEAR UP
COWL FLAP SETTING: BOTH ENGINES 4 6 DEG.
STANDARD ATMOSPHERIC CONDITIONS
TAKE-OFF ENGINE POWER



CHECKED BY:
DATE: 9-3-54
11-1-55
TITLE:
DIVISION
MODEL SUPER DC-3
REPORT NO.:

MODEL SUPER DC-3
MAXIMUM PERMISSIBLE GROSS WEIGHTS
MEETING CAR CLIMB REQUIREMENTS

WAC R-1820 968 C9HE-2 ENGINES
HAMILTON STANDARD PROPELLER NO. I-3417A, BLADE NO. 6615A-0
MANUAL FEATHERING
STANDARD ATMOSPHERIC CONDITIONS

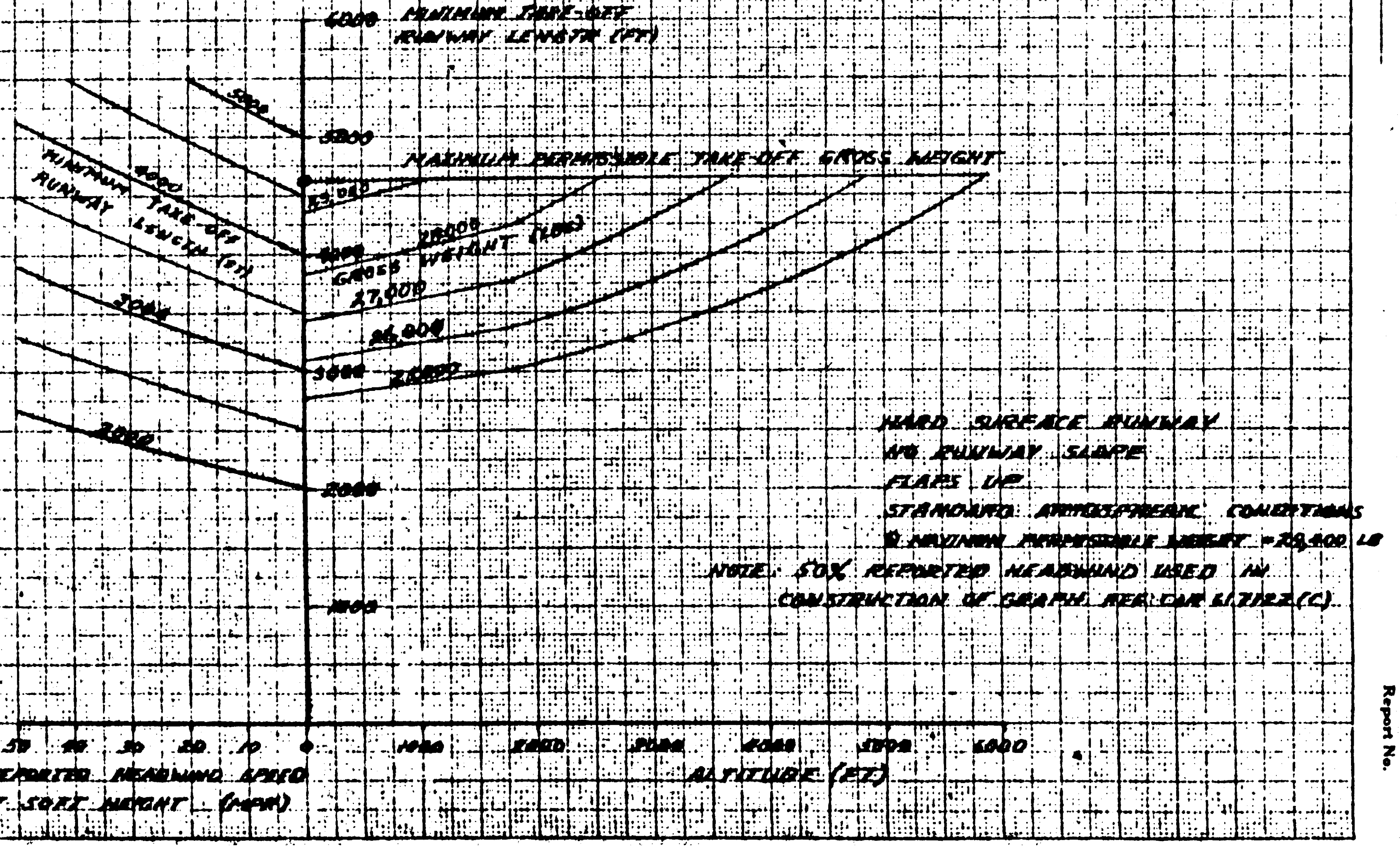


REF: 1803-88.9.1, 1803A-88.9.1

1803-88.9.1B

DC-3S
TAKE-OFF PERFORMANCE
MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R-1820 SKB-PN8-2 ENGINES
HAM STD. PROPELLER 3-9717A, BLADE 6615A-0
PROPELLER WINDMILLING ON INOPERATIVE ENGINE



HARD SURFACE RUNWAY
NO RUNWAY SLOPE
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS
⊙ MAXIMUM PERMISSIBLE WEIGHT = 29,400 LB

NOTE: 50% REPORTED HEADWIND USED IN CONSTRUCTION OF GRAPH. REF. CAR 4b.7122 (C)

TAKE-OFF PERFORMANCE TEMPERATURE ACCOUNTABILITY

As Per CAR 4b.98b

TEMPERATURE ACCOUNTABILITY FOR TAKE-OFF GROSS WEIGHT AT CONSTANT TAKE-OFF RUNWAY LENGTH

Correction to gross weight at temperatures above standard = -15 lbs/°F

Correction to gross weight at temperatures below standard = +15 lbs/°F

TEMPERATURE ACCOUNTABILITY FOR MINIMUM TAKE-OFF RUNWAY LENGTH AT CONSTANT TAKE-OFF GROSS WEIGHT

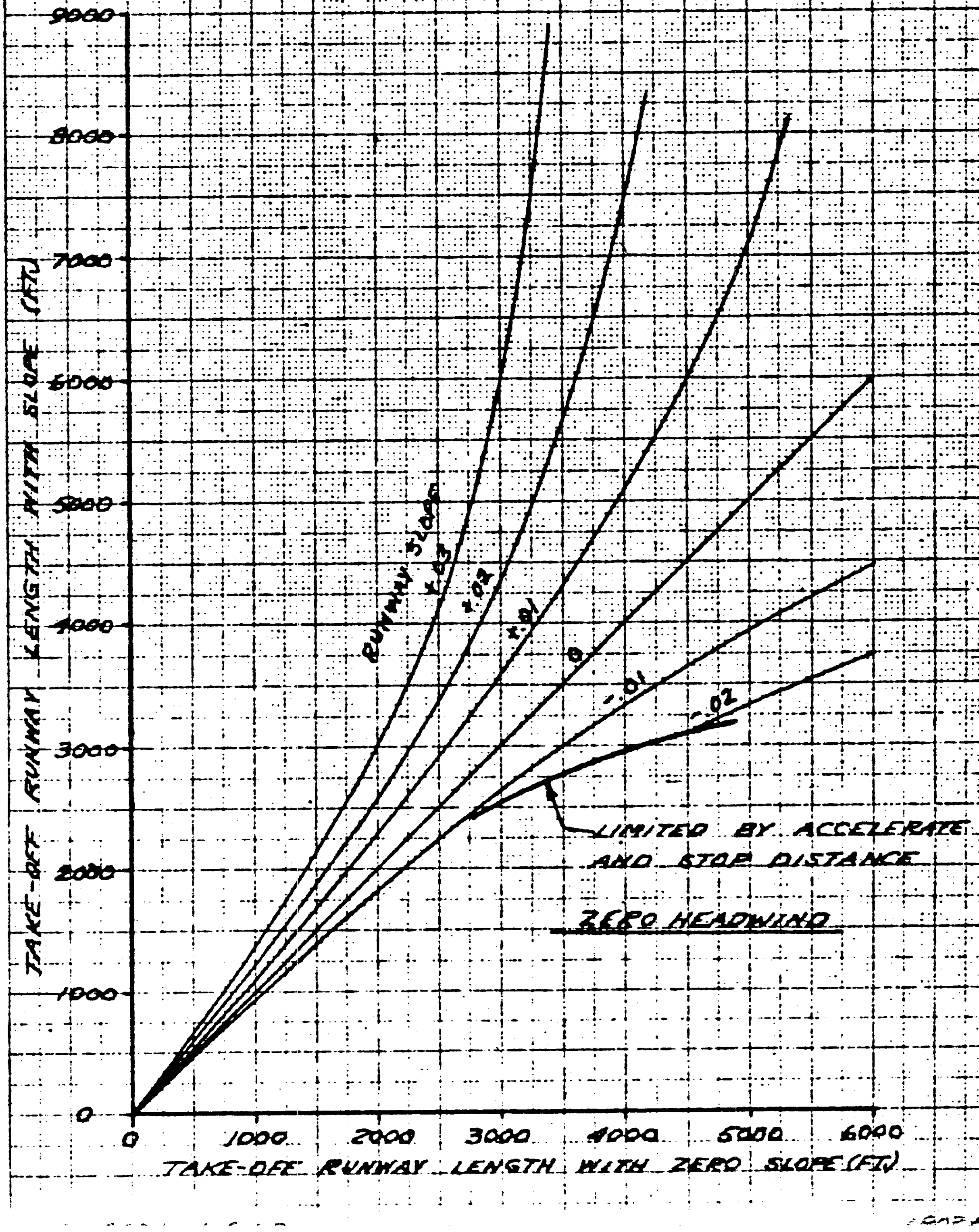
Correction to runway length at temperatures above standard = +10 ft/°F

Correction to runway length at temperatures below standard = -7 ft/°F

True Indicated Critical Engine Failure Speed is unaffected by temperature

MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINMUM TAKE-OFF RUNWAY LENGTH

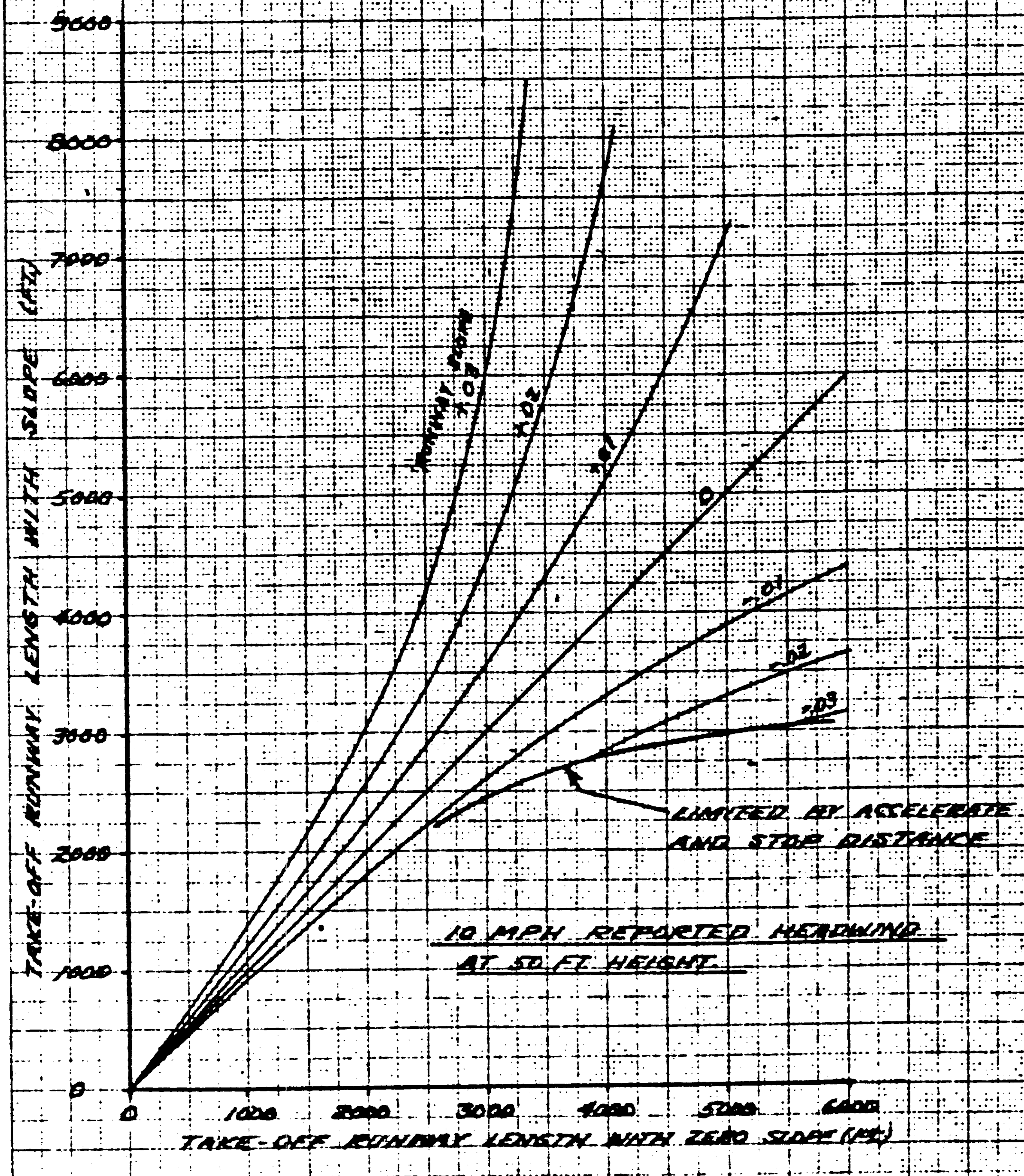
WAC R1820 968C9HE-2 ENGINES
HAM STD PROPELLER NO. 33174; BLADE NO. 6615A-0
PROPELLER WINDMILLING ON INOPERATIVE ENGINE
HARD SURFACE RUNWAY
FLAPS UP STANDARD ATMOSPHERIC CONDITIONS



]

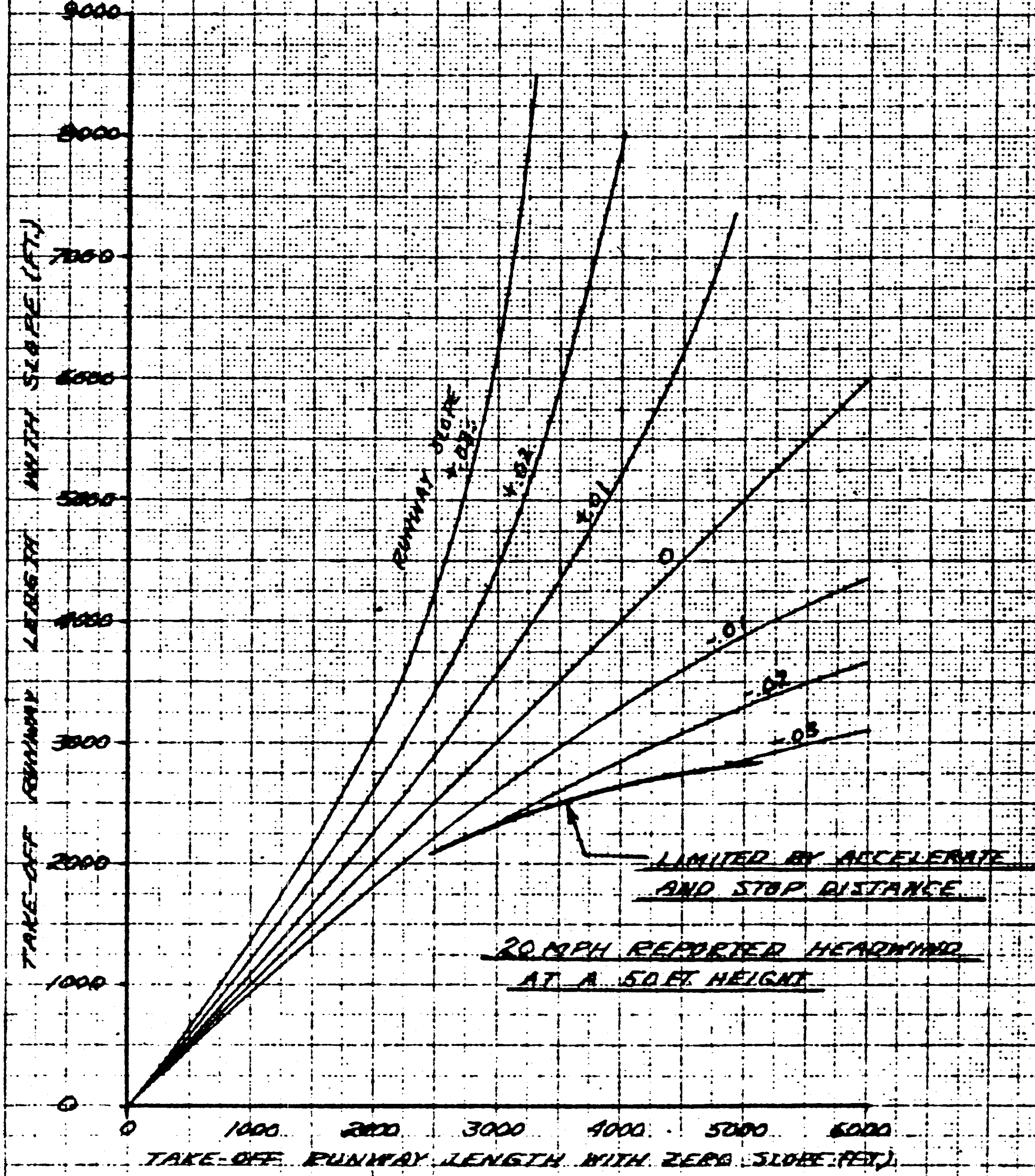
MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R1820-[illegible] ENGINES
HAM STD. PROPELLER NO. 23917A, BLADE NO. 6615A-0
PROPELLER WINDMILLING ON INOPERATIVE ENGINE
HARD SURFACE RUNWAY
FLAPS UP   STANDARD ATMOSPHERIC CONDITIONS



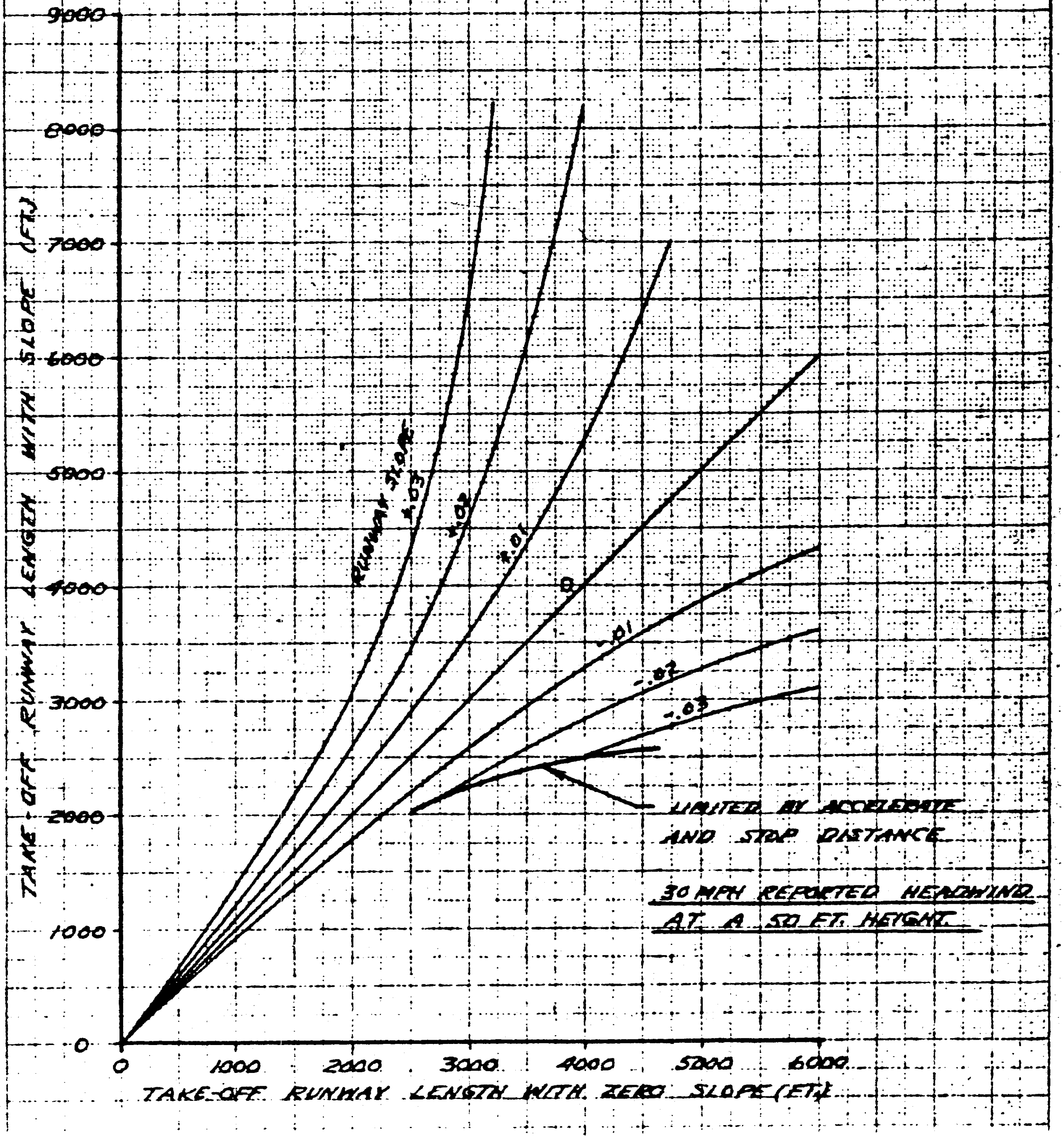
MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R1820-96B C9HE-2 ENGINES
HAM STD PROPELLER NO. I 3417A; BLADE NO. 6615A-0
PROPELLER WINDMILLING ON INOPERATIVE ENGINE
HARD SURFACE RUNWAY
FLAPS UP STANDARD ATMOSPHERIC CONDITIONS



MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

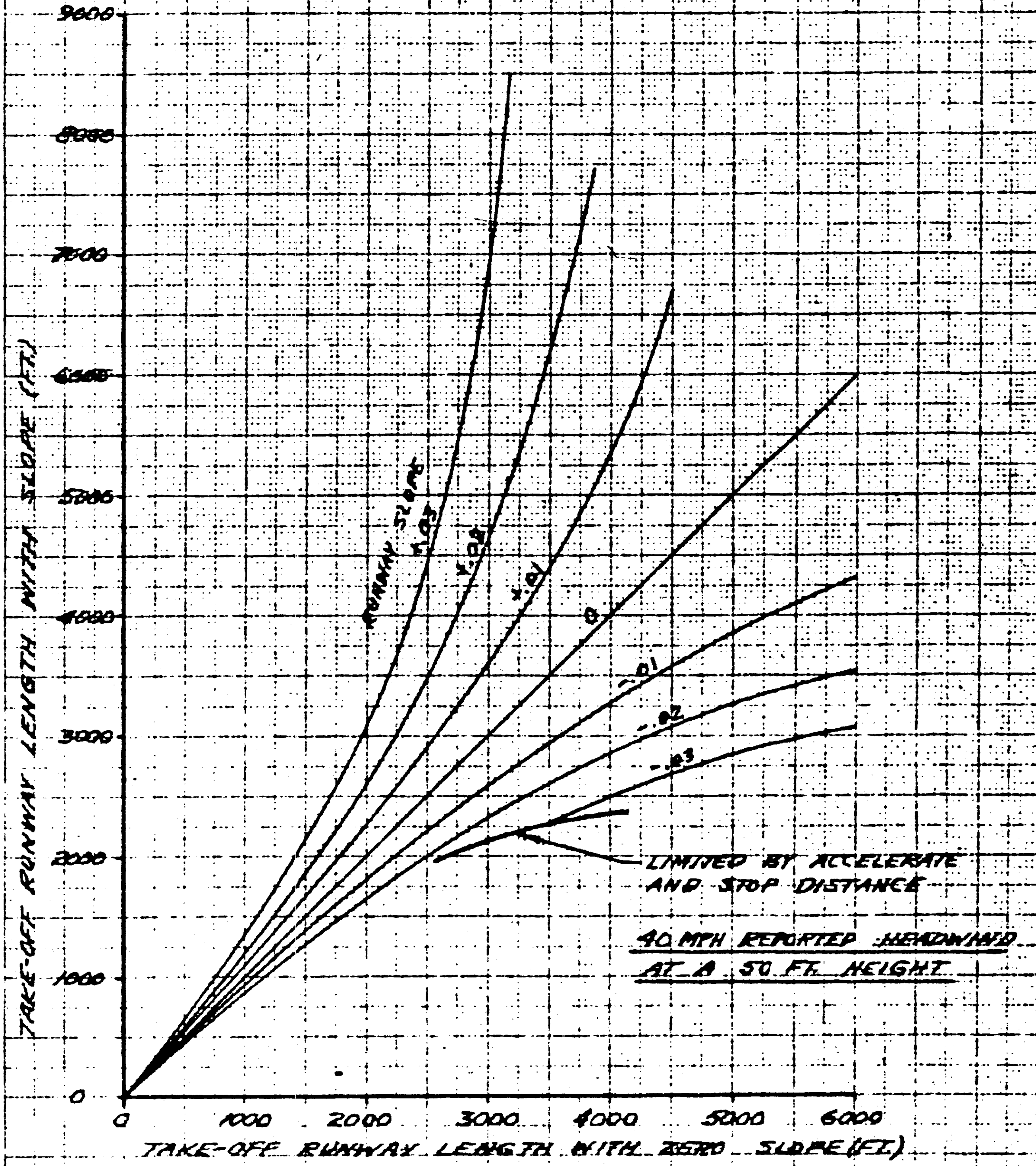
WAC R1820-96B C9HE-2 ENGINES
HAM. STD. PROPELLER NO. I 3417A, BLADE NO. 6615A-0
PROPELLER WINDMILLING ON INOPERATIVE ENGINE
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS



MODEL SUPER DC-3

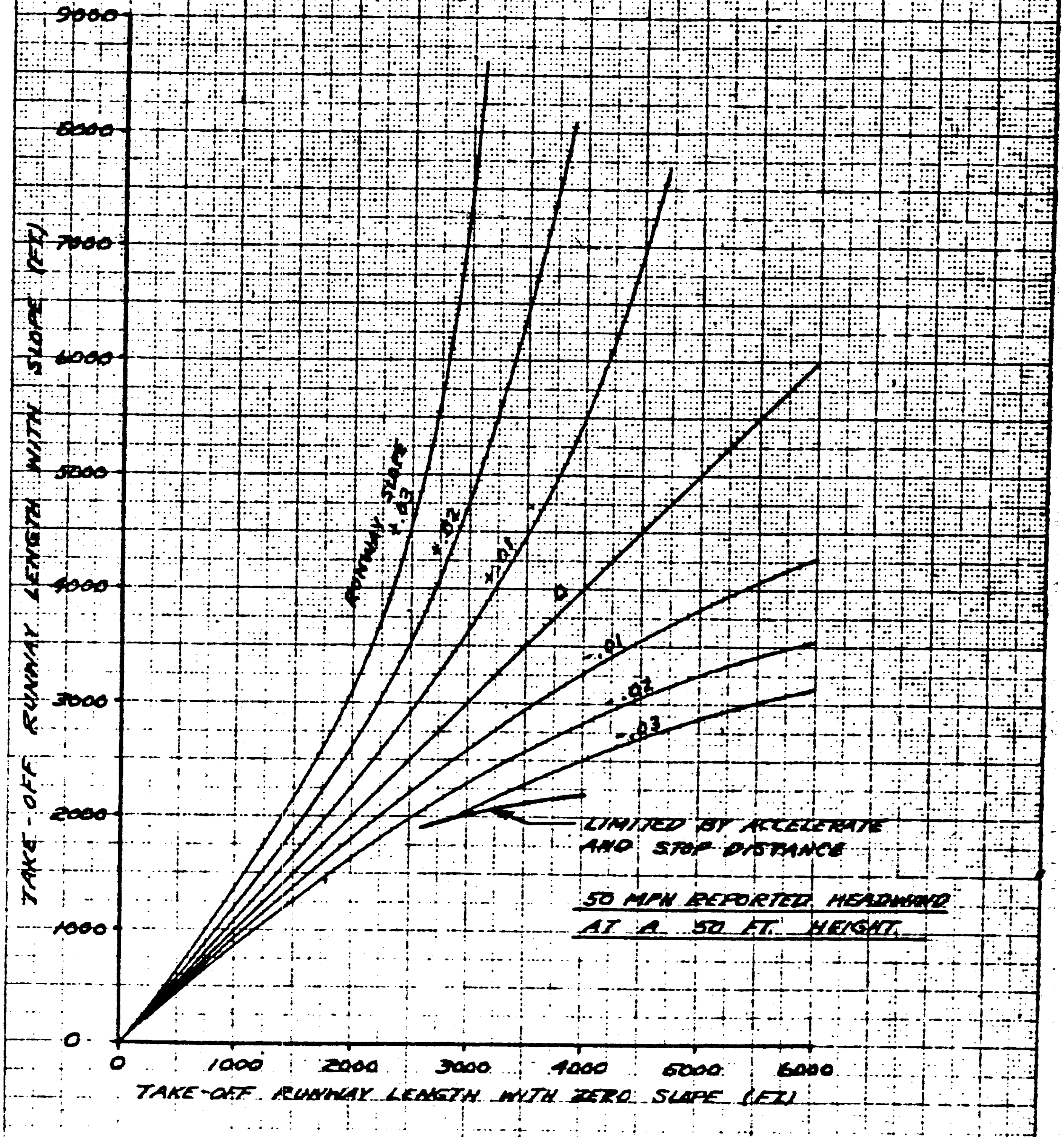
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R1820-96BC9HE-2 ENGINES
HAM. STD. PROPELLER NO. 23412A; BLADE NO. 6615A-0
PROPELLER WINDMILLING ON INOPERATIVE ENGINE
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS



MODEL SUPER DC-3
EFFECT OF RUNWAY SLOPE ON THE MINIMUM TAKE-OFF RUNWAY LENGTH

WAC R1820-96B C9HE-2 ENGINES
HAM STD PROPELLER NO. 23417A, BLADE NO. [illegible]
PROPELLER WINDMILLING ON INOPERATIVE ENGINE
HARD SURFACE RUNWAY
FLAPS UP
STANDARD ATMOSPHERIC CONDITIONS



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SECTION IV

LOADING INFORMATION

Weight & Balance Worksheet

Super DC-3 N 28TN

Config #	Configuration	Adjusted Weight	Adjusted Arm
A	Empty Aircraft	20,798	246.27
(includes 21# survival gear - Autofeather Installed)			

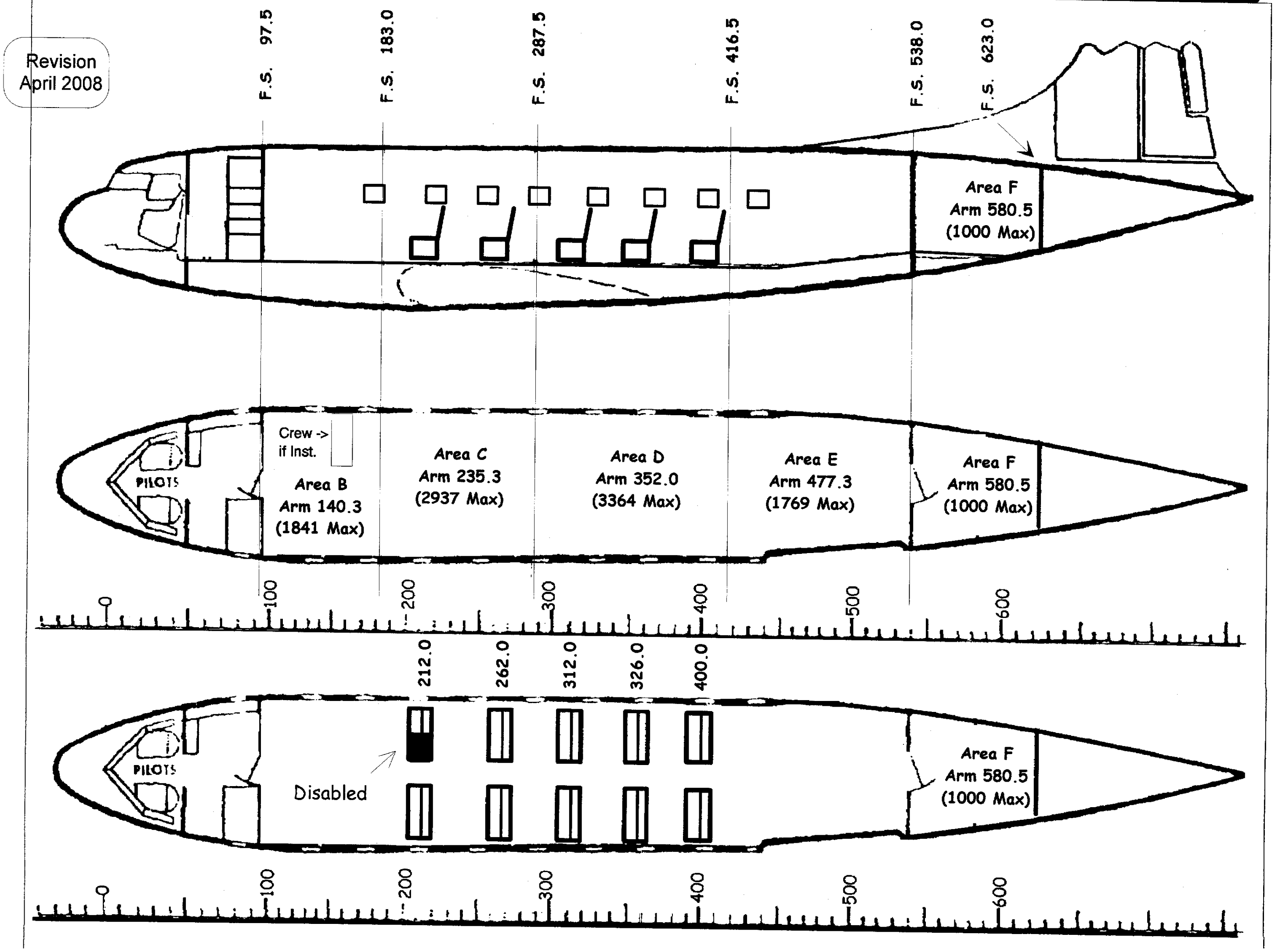
Notes:

1. C.G. Range LG Down (+244.6) to(+282.3)
   LG Up (+240.4) to (+280.8)
2. Ajd Wt for above config is with Gear Down
3. Max Payload is 7,500 lbs and/or 19 passenger seats
5. Above with 25 gal/side oil (55.5 gal max useable)
6. Above with Alcohol Full (Max Cap 20 gal @ 6.5lb/gal)
7. For Authorized Configuration See AFM Supplement
8. Double Crew seat may be installed in Main Cabin.
   Add 40# @ Sta. 125 when seat is installed.
9. Winch may be installed @ Sta. 90.0 by adding 115# at the Installed winch Location. For C.G. considerations the winch may be moved to the back of the aft baggage. (Remove 115# from the winch sta and Add 115# to the Aft Winch Location.
10. Use Pax and Cago wieghts IAW Company Ops Manual.
11. If Autofeather is inop - Max T.O. Wt = 29,325

	Weight	X Arm	= Moment
AC Empty Wt	20,798	246.27	
Flight Crew		31	
Jump Seat		70	
Area A (cockpit)		70	
Winch Mount (115#)		90	
Crew Double (40#)		125.0	
Area B		140.3	
Area C		235.3	
Area D		352.0	
Area E		477.3	
Area F		580.5	
Fwd Ctr Fuel		240.5	
Aft Ctr Fuel		275.9	
Tip Tank Fuel		272.1	
Oil		185.4	
Alcohol		340.5	
Aft Winch (115#)		616.0	
TOTALS ->			
Gear UP C.G.			-29,000

Max T.O Wt = 31,000", Max Lnd Wt = 30,400#

Revision
April 2008



Aircraft Weight and Balance Record

Aircraft #: N28TN **Aircraft Model:** Douglas R4D-8 **Aircraft S/N:** 43354

Date	Item #		Description of Article or Modification	Weight Change						Runnding Basic Empty Weight		
	In	Out		Added (+)			Removed (-)					
				Wt. (lb.)	Arm (in.)	Moment	Wt. (lb.)	Arm (in.)	Moment	Wt. (lb.)	Arm (in.)	Moment
27-Jul-07			Scale Weight							21,025.0	243.53	5,120,218
1-Sep-07		X	NAT Mod RS08-001 S/N 3135				0.30	87.8	26	21,024.7		5,120,192
1-Sep-07		X	Custom Relay Pannel				1.30	80.0	104	21,023.4		5,120,088
1-Sep-07		X	KMA 24H Audio Pannel P/N 066-1055-70 S/N 163517 & rk				1.70	-2.0	-3	21,021.7		5,120,091
1-Sep-07		X	KMA 24H Audio Pannel P/N 066-1055-70 S/N 82489 & rk				1.70	-2.0	-3	21,020.0		5,120,095
1-Sep-07		X	Collins HF Control P/N 622-4545-002 S/N 1301				1.30	-2.0	-3	21,018.7		5,120,097
1-Sep-07		X	Collins HF Pwr Amp P/N 622-2883-001 S/N 2385 & rk				7.90	87.8	694	21,010.8		5,119,404
1-Sep-07		X	Collins HF Transeiver TCR-220 P/N 622-5337-007 S/N 2130 & rk				6.30	87.8	553	21,004.5		5,118,851
1-Sep-07		X	Collins HF Coupler AAC-200 P/N 622-2884-001 S/N 1117 & rk				9.40	87.8	825	20,995.1		5,118,025
1-Sep-07		X	Collins DME-40 P/N 622-1233-001 S/N 8699 & rk				7.40	87.8	650	20,987.7		5,117,376
1-Sep-07		X	Collins DME IND-40A P/N 622-3916-001 S/N 50172				0.90	0.0	0	20,986.8		5,117,376
1-Sep-07		X	Collins Com Type 618-1 P/N 522-2466-004 S/N 2986 & rk				20.70	87.8	1,817	20,966.1		5,115,558
1-Sep-07		X	Collins Com Type 618-1 P/N 522-2466-004 S/N 3558 & rk				20.70	87.8	1,817	20,945.4		5,113,741
1-Sep-07		X	Collins Nav Type 51RV-1 P/N 522-2450-018 S/N 948				18.50	87.8	1,624	20,926.9		5,112,116
1-Sep-07		X	Collins Nav Type 51RV-1 P/N 522-2450-015 S/N 18334				18.30	87.8	1,607	20,908.6		5,110,510
1-Sep-07		X	Double Rack for Type 51RV-1 Nav Radios				3.90	87.8	342	20,904.7		5,110,167
1-Sep-07		X	Collins ADF Type 51Y-4A P/N 522-2587-00 S/N 1903 & rk				9.60	87.8	843	20,895.1		5,109,324
1-Sep-07		X	Collins ADF Type 51Y-4 P/N 522-1836-000 S/N 9821 & rk				10.10	87.8	887	20,885.0		5,108,437
1-Sep-07		X	Collins ADF Control P/N 522-2357-011 S/N 8731				1.80	-1.0	-2	20,883.2		5,108,439
1-Sep-07		X	Collins ADF Control P/N 522-2357-00 S/N 8244				1.80	-1.0	-2	20,881.4		5,108,441
1-Sep-07		X	ADF Flat Antenna P/N 522-2301-005 S/N 3185 (& doublers)				5.00		0	20,876.4		5,108,441
-Sep-07		X	ADF Flat Antenna P/N 522-2301-005 S/N 7094 (& doublers)				5.00		0	20,871.4		5,108,441
1-Sep-07		X	ADF Wire Loop Antenna System - 2 each				12.00	115.0	1,380	20,859.4		5,107,061
1-Sep-07		X	Collins TDR90 Transponder P/N 622-1270-001 S/N 25531 & rk				3.60	87.8	316	20,855.8		5,106,745
1-Sep-07		X	Wilcox 1014A P/N 097768-0101 S/N 2672 & rk				5.80	87.8	509	20,850.0		5,106,236
1-Sep-07		X	Collins NAV Ind. P/N 522-3306-011 S/N 5051				1.30	0.0	0	20,848.7		5,106,236
1-Sep-07		X	Sperry RMI Mod C-6A P/N 1777214-623 S/N 8090994				3.80	-3.0	-11	20,844.9		5,106,247
1-Sep-07		X	RMI Course Ind Millspec C-5824A S/N 38711				2.40	-1.0	-2	20,842.5		5,106,250
1-Sep-07		X	Gables Control Panel - Collins P/N 275606				7.50	0.0	0	20,835.0		5,106,250
1-Sep-07		X	Relay Pannel				0.90	87.8	79	20,834.1		5,106,171
1-Sep-07		X	Misc. Hardware				10.00	75.0	750	20,824.1		5,105,421
1-Sep-07		X	Wire and Antenna cables				49.00	75.0	3,675	20,785.1		5,102,496
1-Sep-07		X	Winter Survival Gear Sled				59.00	514.0	30,326	20,765.1		5,075,095
1-Sep-07	X		GNS 530 GPS/NAV/COM	8.70	-5.0	-44				20,773.8		5,075,051
1-Sep-07	X		GA 56 GPS Antenna	0.30	45.0	14				20,774.1		5,075,065
1-Sep-07	X		GNS 430 GPS/NAV/COM	5.25	-5.0	-26				20,779.4		5,075,038
1-Sep-07	X		GA 56 GPS Antenna	0.30	45.0	14				20,779.7		5,075,052
1-Sep-07	X		KMA 24-3 Audio Pannel	2.50	-3.0	-8				20,782.2		5,075,044
1-Sep-07	X		KR87 ADF	4.85	-4.0	-19				20,787.0		5,075,025
1-Sep-07	X		KA44 ADF Antenna	2.20	60.0	132				20,789.2		5,075,157
1-Sep-07	X		KT70 Mode S Transponder	2.25	-4.0	-9				20,791.5		5,075,148
1-Sep-07	X		KDA 492 Converter	1.91	-10.0	-19				20,793.4		5,075,129
			Total Weight IN / OUT -->	28.26			308.90					

Mechanic's Signature:

Mechanic's Cert #: AP2595102

Date: September 15 2007

New Empty Weight:	20,793.4
New Moment:	5,075,128.8
New C.G.:	244.07

Note: *See AC Logs for previous Sacle Weight and Balance Calculations*

Aircraft Weighing and C.G. Calculation Form

Aircraft Type: Douglas R4D-8
Aircraft Registration: N28TN
Aircraft Serial Number: 43354
Weighing Location: Calgary, Alberta
Weighing Date: 1-Jun-07

Conditions at time of Weighting

- Reference Equipemnt List this date for Items Installed
- Oil tanks filled to 27.74 gal. RT and 27.75 gal. LT
- Forward and Aft Inboard Tanks FULL - Wing Tanks EMPTY
- Alcohol Tank FULL - 11 US Gallons
- Observer's and Crew Seats Installed
- Winch and Survival Gear Installed
- Aircraft & Scales Stabolized in Hanger - Aprox Standard Temp and Pressure
- Arms & Procedure IAW with Airspace Systems Tail Down Weighing Procedures

Equipment used:
FWD Points - Kit 3-007-BA-4C S/N 688-4C
Cert Date: 12/11/06 by VISHAY SI TECHNOLOGIES
AFT Point - Mod: JW-30 S/N M1555C
Cert Date: 5/18/07 by VISHAY SI TECHNOLOGIES

ITEM	Weight	Arm	Moment
Left Main (Corrected for Tare)	12,200	209.40	2,554,680
Right Main (Corrected for Tare)	12,220	209.40	2,558,868
Tail (Corrected for Tare)	1,894	716.50	1,357,051
Totals as Weighed	**26,314**	**245.90**	**6,470,599**
Oil - Usable 55.5 gal @ 7.5 lb/gal	-416	184.5	-76,798
Alcohol Tank (11 gal capacity @ 6.6 lb/gal)	-73	340.5	-24,720
Fuel FWD Inboards Tanks, 396 gal Usable	-2,376	240.4	-571,190
Fuel AFT Inboard Tanks, 382 gal Usable	-2,292	275.9	-632,363
		Total ->	5,165,527
Corrected Empty Weight	**21,157**		
Maximum Weight (w/o Autofeather)	29,325	w/ autofeather 31,000	
Useful Load	**8,168**	**9,843**	
Empty Weight Center of Gravity	**244.15**		

Name	Signature	Cert Num	Date
G. CIRTWILL		AMO 278-91 M343992	01 JUNE 07

Ref TC 6A2 102 (c) and NOTE 1

TRANSNORTHERN

Aircraft EQUIPMENT LIST

Aircraft Make:	Douglas R4D-8
Update Date:	September 2, 2007

Aircraft: N28TN

	#	Description	Part Number	Quantity	Weight	Arm
X	1	Propeller - Hamilton Standard	23E50	2	851	+101.4
X	2	Propeller Governor	4G8	2	12.5	+110.0
X	3	Propeller Feathering Pump - Ham Std.	54772-21	2	43.3	+191.5
X	4	Automatic Feathering System	STC ST2296NM	1	33.5	+97.5
X	101	Wright Engines	R 1820-80B	2	2,790	+121.4
X	102	Fuel & Oil System (Unusable)				
		(a) System Fuel (4 Tanks)			37	+200.0
		(b) System Oil			147.4	+137.2
		(c) System Fuel (Outer Tanks)			92	+255.5
X	103	Oil Coolers (AiResearch	86615-1	2	56.3	+148.4
X	104	Fuel Boost Pump	Pesco 608-PG	2	15.4	+219.0
X	105	Engine Fuel Pump	Pesco 2P-R600	2	6.2	+134.9
X	106	Engine Hydraulic Pump	Pesco 1P-582-JH & JB	2	12.9	+142.0
X	107	Fuel Tanks and Supports	Tank #511058 & 5110509		439	+259.0
		Outer wing cells Nos. 5395982, 5395983				
		5395984, 5395985, 5395986 and Ctr. Wing				
		# 5110508-1, 5110509-1, 5132632, 5132635			496	+263.0
	Landing Gear					
X	201	Main wheel-brake , 17.00-16, Type III				
X		Goodyear Mod LF17.00-16HBMS		2	365	+219.5
		Wheel Ass. 9540547 Brake Ass. 9540385				
X	202	Main Wheel 12-ply Tires	17:00X16 Type III	2	238	+219.5
X	203	Main Wheel Tubes	Type III	2	36	+219.5
X	204	Tail Wheel Structure	Doug Dwg 5371350	1	165.6	+643.8
X	205	Tail Wheel 9.00-6 Type III		1	9.5	+670.0
X	206	Tail Wheel Tire 10 ply 9.00-6 Type III		1	22.7	+670.0
X	207	Tail Wheel Tube 9.00-6 Regular		1	2.9	+670.0
X	208	LG Upper Truss (Forged)	Douglas Dwg 5367272	2	183	+220.0
X	209	LG Shock Struts	Bendix 65900	243	225.6	+220.0
	Electrical Equipment					
X	301	Starters	JH6FR	2	55	+143.0
X	302	Generators	1193-9	2	97.1	+146.2
X	303	Batteries	6 FHM-13	2	159.1	+88.0
X	304	Landing Lights	Grimes 3800A-5	2	6	+312.0
X	305	Navigation Light Flasher	Bendix 450250	1	1.9	77.0
X	306	Wing Tip Light (Model E)	Grimes 3800A-5	2	0.4	+362.5
X	307	Tail Light (Model C)	Grimes 3800A-5	2	0.7	+773.5
X	308	Fueslage Upper Light	Grimes B-4580-24	1	0.3	+336.5

Aircraft: **N28TN**

Aircraft Make:	**Douglas R4D-8**
Update Date:	**September 2, 2007**

	#	Description	Part Number	Quantity	Weight	Arm
O		Fuselage Lower Light	Grimes B-4580-24	1	0.3	+336.5
X	309	Wing Illumination Lights	Douglas Dwg 5365753	2	1.6	+128.0
X	310	Stall Warning System	Douglas Dwgs.	1	2.5	+82.0
X		Pitot Heat Inop Warning System	Form 337	1	1	-10.0
X		"Flaps Down - Gear UP" Warning System	STC SA4149WE	1	0.2	+232.0
O		1500 Inverter, AC	E-1737-1	2		
		--reserved--				
	Interior Equipment					
X	401	Airplane Flight Manual				
X		Ops Manual, MEL, MM, Nav Charts, etc.		-	10	+90.0
	402	Instruments				
X		Ammeter Assy	8DN4AAC2xx	3	1	+10.0
X		Clock Assy		1		+5.0
X		Gauge Assy - Manifold Pressure	AN5770-2A	1		+5.0
X		Gyro Attitude - LH		1		+5.0
X		Gyro Attitude - RH		1	2	+5.0
X		Gyro - Directional LH				+5.0
X		Gyro - Directional RH				+5.0
X		Indicator - Rate of Climb	AN5225-1	2		+5.0
X		Indicator - Turn & Bank	R88I3221	1		+5.0
X		Indicator Assy - Airspeed	R881494	2		+5.0
X		Indicator Assy - Heater Temp	49B10	1		+5.0
X		Indicator Assy - Alcohol Quantity	EA100AN93	1		+5.0
X		Indicator Assy - Electric tachometer	AN5530-2A12	1		+5.0
X		Indicator Assy - Fuel Quantity	EA48-5-24	1		+5.0
X		Indicator Assy - Landing Gear Position	R88I1888	1		+5.0
X		Indicator Assy - Outer wing fuel quant.	EA711C5	2		+5.0
X		Outside Air Temp Indicator		1		+5.0
O		Indicator Assy - Thermometer (2.75")	AN5795-6	2		+5.0
X		Indicator Assy - Trim	15100-1C-A1	1		+5.0
X		Indicator Assy. - Cylinder temperature	94-27971B	1		+5.0
O		RMI - ARC (Air Driven)		2		+5.0
X		Valve Assy - Static Pressure Selector	AN5831-1A	1		+5.0
X		Compass		1	0.4	+5.0
O		Gauge, Suction Airborne PN 1G2-3	S-1435N2	1	0.4	+5.0
X	403	Windshield Wipers	Doug dwr 5390022	1	7.2	+7.3
X	404	Cockpit Fire Ext (Halon Hand Type)	3 lb Halon		7.5	+41.3
X		Cabin Fire Ext. (Halon Hand Type)	3 lb Halon		7.5	+419.9
X	405	Engine CO2 Fire Extinguisher	Walter Kidde		94.2	+73.0
O	406	Flare	Wiley SA-8	2	34.8	+629.8

Aircraft: **N28TN**

Aircraft Make:	Douglas R4D-8
Update Date:	September 2, 2007

	#	Description	Part Number	Quantity	Weight	Arm
O		Flare Chute & Controls Installattion	Doug Dw 5372524		12.1	+483.5
O	407	Lavatory Instaallation inc. Toilet / Chem.	Doug Dw 53765869	1	65.6	+80.0
O		3 gal. Lavatory Water			25	+62.0
X	408	Pilot Seat & Belt	Doug Dw 5115217	2	82.1	+33.8
O	409	Check Pilot Seat	Douglas Dw 5315824	1	18	+70.0
O	410	Cabin Attendant Seat & Belt	Doug Dw 5390042		4.5	+496.0
O	411	Floor Covering				
O	412	Window Curtains				
--	413	Double Seat - First Class	995-NW103x-2R	6	80	-----
--		Single Seat - First Class	995NW103Px-2LMOD-S	7	40	-----
O	414	Baggage Shelf Installation	Doug Dw 5390240		138.9	458.5
X	415	S-200 Heater Installation - 150,000 btu	94A40	1	28.2	+120.8
X		Ground Blower	Westinghouse	1	14	+71.7
X	416	Fire Detector System	Ferwall No. 17343-61	1	29.9	+149.3
O	417	Oxygen System				
O	418	Attendant's Table				
X		Buffet removable equipment				
X	420	Serving Trays				
		"--- reserved --"				
	De-Icing Equipment					
X	501	Wing Boot - Inboard	11-728-1-1	2	14	+202.0
X		Wing Boot - Outboard	11-728-2-1	2	51.8	+260.5
X		Vertical Stabilizer Boot	11-728-6-1	1	7	+659.6
X		Horizontal Stabilizer Boot	11-728-5-1	2	26	+667.5
		"--- reserved --"				
X		Deicer System Assembly	5393369	1		
X		Engine Driven Vacuum Pumps (Pesco)	3P-207-JE	2		
X	502	Alcohol System for Carbs & Props & WS		1	31.1	+223.3
X		Anti-Icing Alcohol		11 gal	78.9	+340.5
	Misc.					
X		Spare Gallon of 5606 Hyd Fluid		1	8	+90.0
X		Engine PreOiling System		1	43	+191.5
O		JAMCO Smoke Detector (Aft Baggage)	PU90-421S	1	0.8	+602.0
O		Crew Oxygen Bottle	Scott P/N 801307	1	45.11	+50.0
O		Puritan Oxygen Regulator	172010-01	1	1.8	+50.0
O		Aerox Crew O2 Mask with Microphone	MSK-AEM	2	2.2	+38.0
O		Aerox Crew O2 Mask without Microphone	MSK-AS	1	1.1	+50.0
O		PBE - Scott Model 5600 walk around bottle	5601	1	11.2	+97.5
X		Winch Installation Borek 12, 1999	Waren XD9000i	1	90	+115.0
X		First Aid Kit		1	2	

Aircraft Make:	**Douglas R4D-8**
Update Date:	**September 2, 2007**

Aircraft: **N28TN**

	#	**Description**	**Part Number**	**Quantity**	**Weight**	**Arm**
O		Winter Survival Gear Kit		1	59	+540.0
X		Cabin Crew Seats	LSDA	1	40	+125.0
X		Observer's Seat	LSDA	1	20	+78.0
X		Ski Provisions		1	75	+230.0
X		Guardian Carbon Monoxide Detector	Model 25	1		
		-- reserved --				
		-- reserved --				
	Avionics					
X		GNS 530 GPS/NAV/COM/DME	011-00550-10	1	8.70	-5.0
X		GA 56 GPS Antenna	011-00147-00	2	0.60	+45.0
X		GNS 430 GPS/NAV/COM		1	5.25	-5.0
X		KMA24-3 Audio Pannel	066-1055-03	1	2.50	-3.0
X		KR87 ADF	066-01072-0014	1	4.85	-4.0
X		KA44 ADF Antenna	071-1234-00	1	2.20	+60.0
X		KT-70 Mode S Transponder	066-01141-0101	1	2.25	-4.0
X		Marker Beacon Antenna	AV-569	1	0.50	
X		Compas System	C-118B	1	-	
X		- Directional Gyro - Sperry	DG-233	1	9.90	
X		- Pilot's RMI	Sperry C-6A	1	4.30	
X		- Electronics Rack	Sperry 614937-10	1	4.50	
X		- Lattiude Controller	Sperry 177132-22	1	0.80	
X		- Remote Compensator	Sperry CS-313	1	1.50	
X		- Flux Valve and Mount	Sperry 656520	1	2.50	
X		Radio Altimiter - ALT-50	Collins 860F-2	1	5.00	
X		- Indicator	Collins ALI-55	1	1.20	
X		- Fwd Antenna	Sensor S67-2002	1	0.50	
X		- Aft Antenna	Sensor S67-2002	1	0.50	
X		GPS Reciever - Trimble	TNL-2000A	1	2.70	
X		- Antenna -- Trimble	16248-20	1	0.40	
X		- Switching Unit	NAT RS08-350	1	0.40	
X		Intercom	NAT AA80-020	1	0.65	
X		Inverter #1 - Flitetronics	PC-15BC	1	7.50	
X		Inverter #2 - Flitetronics	PC-15BC	1	7.50	
X		ELT	ELT-10	1		

APPENDIX A

GENERAL INFORMATION

A-1. THE AIRPLANE.

The Douglas Super DC-3 airplane is a low-wing monoplane accommodating from 30 to 37 passengers and a crew of three: pilot, co-pilot, and a cabin attendant. The over-all dimensions of the airplane are: span 90 feet; length 67 feet 8.5 inches; height 18 feet 3 inches.

A-2. FLIGHT CONTROLS.

All primary flight controls are conventional in operation. The wing flaps are hydraulically operated by a three-position control located on the post aft of the co-pilot. A wing flap position indicator is mounted forward of the pilot just below the main instrument panel. The rudder trim tab, elevator trim tabs, and right aileron trim tab controls are mounted on the control pedestal; each control is provided with an adjacent position indicator.

A-2-1. SURFACE CONTROL LOCKS. -- On some airplanes, the aileron, elevator, and rudder control systems are provided with a cable-controlled mechanical gust lock -- a device for mechanically holding the control surfaces rigidly in the neutral position. The surface control lock lever is installed between the two throttle levers on the control pedestal and incorporates a throttle interlock feature. With the lever in the engaged (aft) position, not more than one throttle lever at a time can be advanced beyond 30 inches Hg. With the lever in the disengaged (forward) position, the throttle inter-lock feature is released along with the release of the locks on the surface controls. When the mechanical gust lock system is not installed, manual gust locks are provided to be inserted on the control surfaces to prevent surface movement.

A-3. LANDING GEAR.

The main landing gear and the tail wheel are extended and retracted simultaneously by the hydraulic system. The main landing gear is completely enclosed, when retracted, by doors that are mechanically actuated by the landing gear. The tail wheel is partially retractable with less than one half of the wheel exposed during flight. A landing gear control lever actuated latch and a solenoid-operated latch are provided to prevent inadvertent retraction of the landing gear with the airplane on the ground. Complete retraction of the landing gear requires not more than seven seconds at a temperature of 70°F (21°C) at 102 mph. Maximum airspeed for landing gear extension is 166 mph TIAS. The landing gear up line is protected against excessive gust loads during retraction by a 7000 psi relief valve.

A-3-1. LANDING GEAR CONTROL LEVER. -- Retraction and extension of the main landing gear and tail wheel is simultaneously controlled by an "UP-DOWN" lever mounted on the bottom of the post aft of the co-pilot. The lever cannot be moved to the "UP" position until the landing gear safety latch lever is raised to the "LATCH RAISED" (full up) position. No neutral position is provided for the lever.

A-3-2. LANDING GEAR SAFETY LATCH LEVER. -- The three-position landing gear safety latch lever, located on the floor inboard of the pilot, mechanically prevents moving the landing gear control lever to the "UP" position. The safety latch lever also is cable-rigged to a spring-loaded latch on each main gear to prevent inadvertent retraction when the full weight of the airplane is on the ground. The safety latch lever is in turn secured in the "POSITIVE LOCK" (full down) position by a solenoid pin that engages the lever (in the event that the solenoid fails to release after take-off, the pin can be manually retracted by means of a finger tab). The solenoid is actuated by the landing gear safety switch. To release the landing gear control lever to the "UP" position, the safety latch lever must be pulled to the full upright position ("LATCH RAISED"). The safety latch lever will automatically remain in that position. When the landing gear control lever is returned to the "DOWN" position, the safety latch lever will automatically move to the "SPRING LOCK" (middle) position. When the green landing gear indicator lights come on, the safety lever should be placed in the full down ("POSITIVE LOCK") position which will engage the mechanical safety latch on each main gear.

A-3-3. LANDING GEAR SYSTEM INDICATORS. -- The position of the landing gear is indicated by three green lights (one for each gear) and one red light on the main instrument panel. Each of the three green lights is illuminated when its respective gear is down and latched. The red light is illuminated when all or one of the gears is in any intermediate position. All of the lights will be out when the gear is up. When the gear is up or in any intermediate position and one or more

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throttles are retarded past the one-quarter-open position, a warning horn will sound, in addition to the red light illuminating.

A-3-4. LANDING GEAR SAFETY SWITCH. -- A safety switch, mounted on the right main landing gear, is closed when the weight of the airplane is on the gear to either deter or permit the operation of certain equipment. When closed, the switch makes the landing gear warning horn and the stall warning system inoperative, actuates the landing gear safety latch lever locking solenoid, and prohibits operation of the buffet electrical equipment, cabin heater circuit, and the cabin heater ground blower unless an external power source is connected to the airplane or the engines are operating. When open (weight of the airplane off the gear) the switch de-energizes the landing gear safety latch lever solenoid and the cabin heater ground blower and energizes the buffet and landing gear warning horn circuits.

A-3-5. LANDING GEAR GROUND SAFETY EQUIPMENT. -- Safety pins are provided and are installed manually in the main landing gear linkage to prevent the inadvertent retraction of the gear with the airplane on the ground. The tail wheel is provided with a cable to prevent retraction on the ground. Both the pins and the cable are stowed in the airplane in a canvas container.

A-4. CROSS-WIND LANDING GEAR (IF INSTALLED).

On some airplanes, a special cross-wind landing gear is installed on which each main wheel incorporates a castering device to permit making a cross-wind landing without the necessity of aligning the airplane with the runway prior to contact. With the castering device free to operate, the airplane can assume a maximum landing angle of 15 degrees left or right of the center line of approach. For conventional operation, the wheels are locked in the centered position by hydraulically actuated taxi-locks controlled from the cockpit by the same control lever that actuates the tail wheel lock. Warning lights illuminate, indicating that the wheels are unlocked and free to caster.

A-4-1. CROSS-WIND LANDING GEAR CONTROL. -- The cross-wind landing gear taxi-locks are locked and unlocked by the same lever that controls the tail wheel lock, located on the underside of the control pedestal. For normal take-offs and landings, the lever is placed in the "LOCK" (full forward) position. In this position, both the main gears and tail wheel are locked in the fore-and-aft position. For taxiing the airplane, the lever is placed in the tail wheel "UNLOCK," cross-wind gear "LOCK" (center) position. This allows the tail wheel to turn as required. For operating the airplane with the cross-wind landing gear in operation, pull the lever to the tail wheel "UNLOCK," cross-wind gear "UNLOCK" (full aft) position.

A-4-2. CROSS-WIND LANDING GEAR INDICATOR LIGHTS. -- Two amber lights, one for each main gear, are located on the right side of the main instrument panel. The lights will illuminate whenever the cross-wind landing gear taxi-lock cylinders are fully released and the main wheels are free to caster.

A-5. TAIL WHEEL.

The tail wheel is partially retractable, permitting the strut and the upper portion of the tail wheel to become flush with the fuselage, leaving less than one-half of the tail wheel exposed during flight. The tail wheel may be locked or unlocked in the fore-and-aft position as required for taxiing purposes or for cross-wind landings.

A-5-1. TAIL WHEEL LOCK CONTROL. -- Retraction and extension of the tail wheel is accomplished simultaneously with the main landing gear by means of the two-position landing gear control lever located at the bottom of the post aft of the co-pilot. For normal operation, the tail wheel is locked in the center position by the tail wheel locking lever, located on the underside of the control pedestal. For taxiing, this lever is moved to the tail wheel "UNLOCK," cross-wind gear "LOCK" (center) position to allow the tail wheel to caster freely as required. On some airplanes, the lever can be removed to a full aft "UNLOCK" position, which permits the castering of both the tail wheel and the cross-wind main landing gear wheels, as required.

A-6. WING FLAPS.

The hydraulically-actuated, split-type center wing flaps extend 14 inches into each outer wing panel and are designed to permit full extension at an indicated airspeed of 133 mph.

A-6-1. WING FLAP CONTROL. -- The wing flaps are raised and lowered by means of a wing flap control lever, located on the post aft of the co-pilot. The control lever has three positions: "UP," "NEUTRAL," and "DN" (down). A mechanical wing flap position indicator, mounted directly below the main instrument panel just forward of the pilot's seat has the following indicated positions: "FULL FLAP," "3/4 FLAP," "1/2 FLAP," "1/4 FLAP," and

"O FLAP." To lower the flaps, move the wing flap control lever from "NEUTRAL" to "DN" (down). When the flaps reach the desired position, as indicated on the wing flap position indicator, move the lever back to "NEUTRAL." The control lever should be kept in the "NEUTRAL" position at all times that movement of the flaps is not required. Relief valves are installed in the system to protect against thermal expansion.

FLAP EXTENSION SPEEDS

Full Flap	133 mph TIAS
3/4 Flap	133 mph TIAS
1/2 Flap	134 mph TIAS
1/4 Flap	147 mph TIAS

A-7. HYDRAULIC SYSTEM.

The constant-pressure-type hydraulic system, with a system pressure of 1100 psi, extends and retracts the main landing gear and tail wheel, actuates the windshield wipers, operates the brakes, raises and lowers the wing flaps, opens and closes the main passenger entrance door, and, on those airplanes equipped with a cross-wind landing gear, actuates the cross-wind taxi-lock cylinders. Hydraulic pressure is supplied to the system by two engine-driven hydraulic pumps. The pressure supply lines from the pumps are teed together to ensure system operation in the event of one-engine failure. A hand pump is provided in case of insufficient hydraulic pressures. The capacity of the hydraulic system is sufficient to operate gear and wing flaps together. Relief valves are installed in the landing gear hydraulic lines to prevent undue pressures caused by thermal expansion. The system has a capacity of 2.3 gallons, supplied by a reservoir located behind the co-pilot's station, and is for use with Skydrol hydraulic fluid (see Figure A-1, Hydraulic System Schematic).

A-7-1. HYDRAULIC HAND PUMP. -- A hydraulic hand pump is provided at the bottom of the post aft of the co-pilot. When a loss of pressure occurs and it is desired to operate any of the units in the hydraulic system, move the control for that unit to the desired position and operate the hand pump. The hand pump also may be used to build up pressure in the pressure accumulator, provided that the hydraulic hand pump shut-off valve is opened.

A-7-2. HYDRAULIC HAND PUMP SHUT-OFF VALVE. -- The hydraulic hand pump shut-off valve is located at approximately the center of the post aft of the co-pilot's seat. Normally, this control is wired in the "OFF"

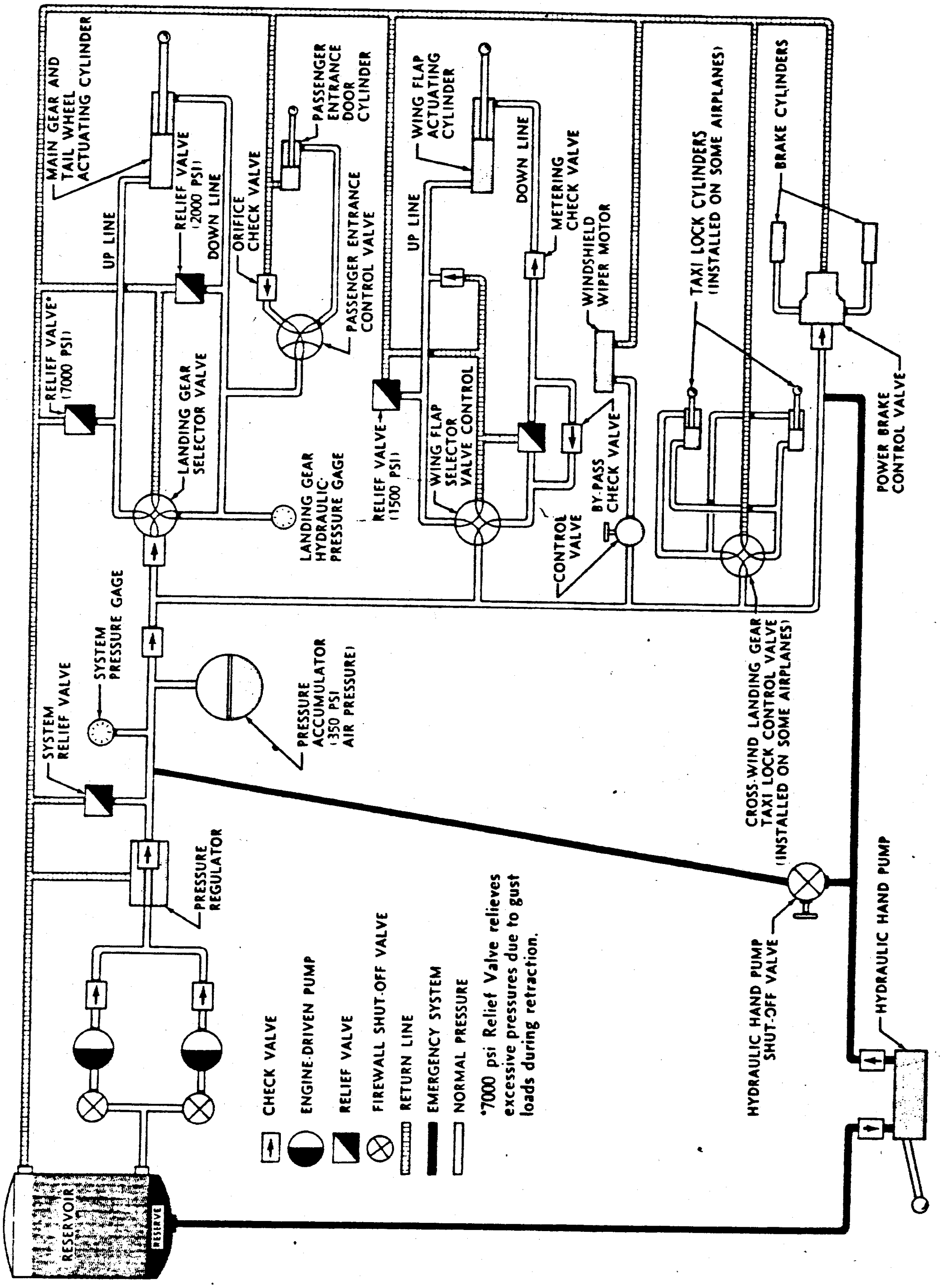

Figure A-1 - Hydraulic System

position, during which time the various hydraulic units may be operated with the hydraulic pump, if necessary. If it is desired to pump up the pressure accumulator with the hand pump, the shut-off valve control must be placed in the "ON" position. When pumping up the pressure accumulator with the hand pump, the pressure will register on the hydraulic system pressure gage, located to the right of the main instrument panel. When the shut-off valve is wired in the "OFF" (normal) position, the gage will not indicate hand pump pressures. It should never be necessary to use the valve in flight; it should be restricted to ground use.

A-7-3. HYDRAULIC PRESSURE GAGES. -- The hydraulic system pressure gage and the landing gear pressure gage are located on a panel to the right of the main instrument panel. The hydraulic system pressure gage indicates the amount of fluid pressure in the hydraulic lines and the pressure accumulator. The landing gear pressure gage registers the pressure in the landing gear down line, and also registers the hand pump pressure, provided that the landing gear control is in the "DOWN" position and the hand pump is in operation.

A-7-4. HYDRAULIC SYSTEM FIREWALL SHUT-OFF VALVES. -- Hydraulic system firewall shut-off valves are installed aft of each nacelle firewall in the hydraulic fluid supply lines. The control handles for operation of the valves, located below a cover on the floor between the pilot's and co-pilot's seats, also operate firewall shut-off valves for the fuel and oil systems.

A-7-5. WINDSHIELD WIPERS. -- The two windshield wipers are operated by hydraulic pressure in a synchronized movement. The windshield wiper speed-control valve, located on the post behind the co-pilot, acts as an on-off control and also regulates the wiper speed. The blades are locked in position when the control is turned "OFF." Full or partial stoppage of one blade will not interfere with complete operation of the other blade. Care should be taken not to operate the windshield wipers on dry glass.

A-8. BRAKES.

A-8-1. HYDRAULIC BRAKES. -- The main landing gear wheels are equipped with hydraulic brakes which are conventionally controlled by toe pressure on the rudder pedals.

A-8-2. EMERGENCY AIR BRAKES. -- A metering-type air brake system is installed for use in the event of failure of the hydraulic brake system. Air, at 1590 psi, is

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stored in a bottle directly behind the co-pilot's seat and is controlled by the air brake control lever mounted below the vee of the windshield. After using the air brakes for stopping, no attempt should be made to taxi the airplane; ground equipment should be used to tow the airplane from the runway.

A-8-3. EMERGENCY AIR BRAKE PRESSURE GAGE. -- The emergency air brake pressure gage, located on a panel to the right of the main instrument panel, registers pressure in the air bottle located directly behind the co-pilot's seat. Normal pressure is 1590 psi.

A-8-4. PARKING BRAKES. -- The main landing gear hydraulic brakes may be set for parking by using the parking brake knob located on the aft face of the control pedestal. To set the brakes for parking, make certain that there is at least 500-psi pressure in the main hydraulic system. Depress the brake pedals full down and pull out the parking brake knob. Release the brake pedals as soon as the braking lugs snap into place, and then release the parking brake knob. To release the brakes, step on the brake pedals; the parking brake knob should snap in. Under no circumstances should the parking brakes be set while in flight.

A-9. POWER PLANT.

The airplane is powered by two R-1820, 9-cylinder Wright Cyclone Model 968C9HE2, air-cooled radial engines equipped with a single speed supercharger. Fuel is metered by a Stromberg injection-type carburetor. Ignition consists of two Bosch magnetos. The ignition harness and spark plugs are shielded to prevent interference with radio communication. The engine-driven accessories are mounted on the engine rear section. Cables connect operating levers in the pilot's cockpit with control units on the engine to govern carburetor mixture, throttle, and carburetor air positions.

A-9-1. POWER PLANT CONTROLS.

A-9-2. THROTTLE CONTROLS. -- The two throttle control levers are installed at the top of the control pedestal, one throttle control lever for each engine. A gust lock and throttle inter-lock lever is installed between the two throttle control levers to prevent take-off when the gust lock is engaged. The inter-lock consists of a small latch which pivots either to left or right as desired to prevent full opening of the respective throttle control lever. Thus, only one engine can be opened to take-off power at a time. The throttle control levers may be locked in any desired position by applying the lock control, which is a knob located on the aft face of the control pedestal directly under the throttle control levers. Turning the control clockwise locks the throttle levers in the desired position and prevents "creeping" of the controls.

A-9-3. MIXTURE CONTROLS. -- The two mixture control levers, installed at the top of the control pedestal, control the proportion of fuel and air mixture required by each engine. Each control lever has a thumb-operated catch-type lock which enables the control to be locked in either the "IDLE CUT-OFF," "AUTO LEAN," or "AUTO RICH" positions.

A-9-4. CARBURETOR AIR TEMPERATURE (PREHEAT) CONTROLS. -- The two carburetor air temperature controls, one for each engine, are cable-operated and are mounted on the right side of the control pedestal. Two positions are marked "COLD" and "HOT," with intermediate positions available. A lock lever is provided to hold the controls in the desired position. As a control is moved towards the "HOT" position, a door moves in the respective engine air induction system to cut off part of the ram air supply, replacing it with heated air from around the engine. All engine starts, take-offs, and landings are to be made with the controls in the "COLD" positions. Do not exceed 38°C (110°F) at any time.

A-9-5. COWL FLAP CONTROLS. -- The two cowl flap control switches, located on the left overhead electrical control panel, control the cowl flap actuators and have the following positions: "OPEN," "CLOSE," "OFF," and "CLIMB." Promptly returning a switch to the "OFF" position will result in a relatively slow travel of the cowl flaps for close adjusting. When the switches are placed in the "CLIMB" position, the cowl flaps are not held rigidly in place, but are free to open or close slightly depending upon the force of the airstream.

A-9-6. ENGINE IGNITION CONTROLS. -- Two ignition control switches are located above the center of the windshields. Each switch has conventional positions: "LEFT," "RIGHT," and "BOTH." A knob marked "PULL OFF" is used to turn off the ignition system to both engines in case of emergency.

A-9-7. ENGINE STARTER CONTROLS. -- Each engine is equipped with a direct cranking starter. The engine starting controls, located on the right overhead electrical panel, consist of an engine selector switch for choosing the engine to be started and primed, a start switch for energizing the starter, a starter safety switch to prevent inadvertent operation of the starter switch, a boost switch to provide adequate electric boost for the magnetos,

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and a priming switch to aid in starting the engines. Except for the engine selector switch, all switches are spring-loaded. The engine starter selector switch must be out of the "OFF" position and set to the engine being started before either the start or prime switches can be energized. The starter safety switch and the starter switch must both be depressed before the boost switch will function.

All radio equipment must be off during engine start to eliminate booster cart voltage surge.

A-9-8. POWER PLANT INDICATORS. -- The power plant indicators, mounted on the main instrument panel, consist of a dual-indicator manifold pressure gage, a dual tachometer, two single-indicating cylinder head temperature gages, and a dual carburetor air temperature gage.

A-10. PROPELLERS.

Each engine is equipped with a Hamilton Standard Hydromatic full-feathering propeller. Constant propeller speeds are maintained by a cable-controlled governor which changes the propeller pitch as required by pumping and metering flow of oil from the engine oil system. The propeller low-pitch position is 18 degrees and the extreme high-pitch position (or feathered angle) is 88 degrees.

A-10-1. PROPELLER RPM CONTROLS. -- The propeller rpm control levers, mounted on the left side of the control pedestal, enable the pilot to automatically maintain a constant engine speed by causing a change in propeller blade angle through the constant speed range (1250 rpm minimum to 2800 rpm maximum). To increase propeller rpm, the levers are moved forward. To decrease propeller rpm, the levers are moved aft.

A-10-2. PROPELLER FEATHERING CONTROLS. -- A push-button control switch, located on each overhead electrical panel, is provided for each propeller feathering system. A red light in each propeller feathering button will illuminate whenever the respective automatic feathering system is actuated.

A-10-3. PROPELLER AUTOMATIC FEATHERING CONTROLS. -- The propeller feathering system incorporates a torque pressure switch that will operate to automatically feather the propeller of a failing engine during take-off. A 1 3/4-second delay device is installed to prevent automatic feathering in the event of a momentary power loss resulting from surging (the delay device is independent of the conventional manual feathering circuit). As dur-

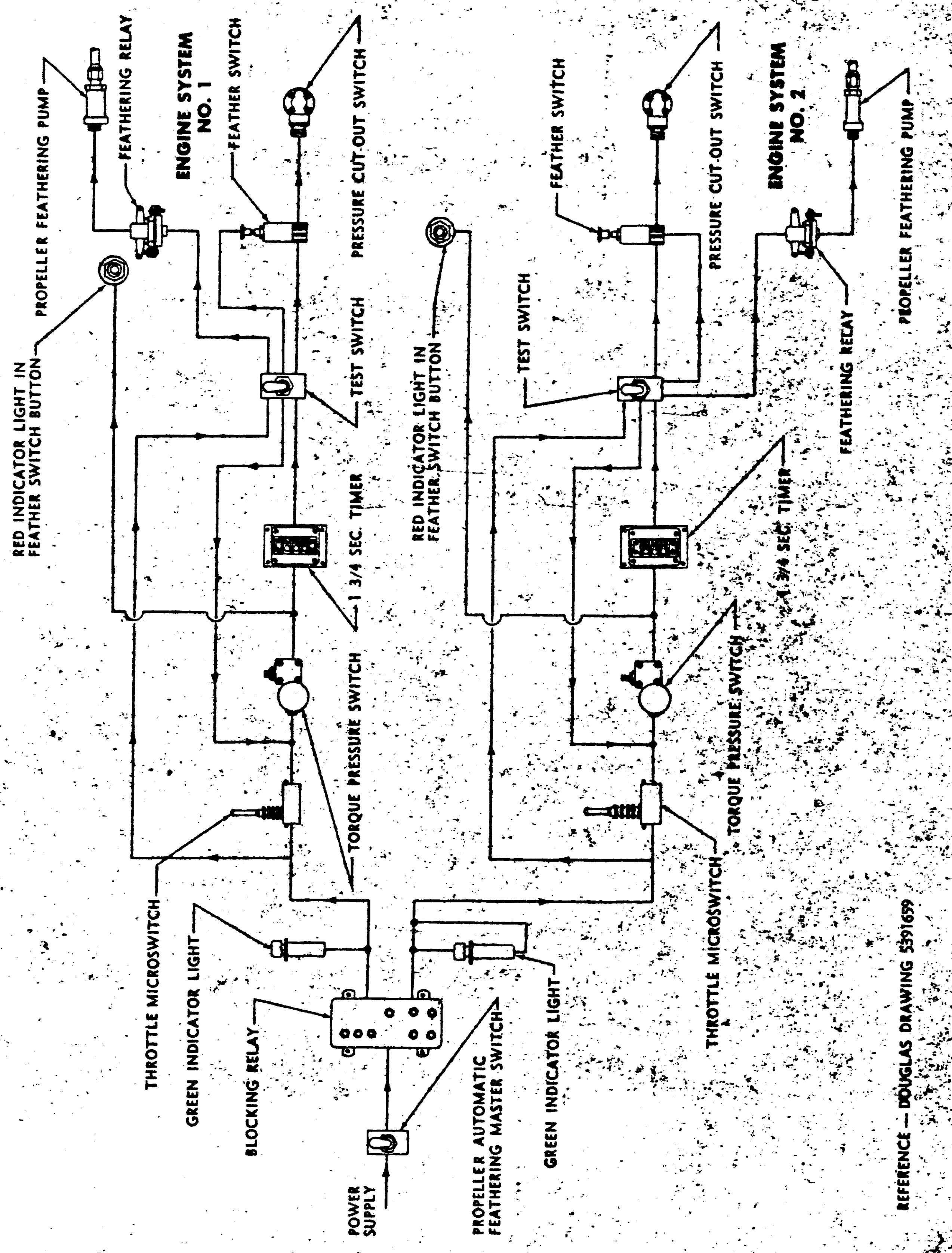

Figure A-2 - Propeller Feathering Schematic ing normal feathering, automatic feathering may be stopped at any time by pulling out the respective feathering button (see Figure A-2, Propeller Feathering Schematic).

The automatic feathering controls are mounted on the right overhead electrical panel and consist of a master auto-feathering switch marked "AUTOMATIC FEATHERING," "OFF," and "RESET," and two auto-feathering test switches to test out the respective circuits prior to take-off. A green ready light is mounted above each test switch. To energize the automatic feathering circuit, position the master feathering switch first to "RESET," then to "AUTOMATIC FEATHERING," which will illuminate the green ready lights. As the throttles are advanced past approximately 85 percent take-off power, each throttle closes a switch to complete the automatic feathering circuit to a torque pressure switch (retarding one or both throttles before take-off is completed will open the throttle switch and de-energize the automatic feathering circuit). If a 75 percent power loss occurs in either engine during take-off, and the loss exceeds 1 3/4 seconds, the respective feathering button will illuminate and pop in and the propeller will feather. After the propeller has fully feathered, both the red and the green auto-feather lights will go out. After the power reduction to climb settings, the master feathering switch should be returned to the "OFF" position.

When one propeller feathers automatically, a blocking relay de-energizes the automatic feathering circuit for the opposite engine to make it impossible for both propellers to feather simultaneously.

A-10-4. PROPELLER SYNCHROSCOPE INDICATOR (IF INSTALLED). -- On some airplanes, a propeller synchroscope indicator is installed on the left section of the main instrument panel to give indication of propeller synchronization by measuring the electrical power differential between the two engine magnetos. If the propellers are synchronized, the indicator needle will remain in an upright position. If one propeller rpm exceeds that of the other, the needle will indicate on that side of the upright position.

A-11. FUEL SYSTEM. The fuel system is designed as a suction system, and consists basically of four center wing tanks with two five-position tank selector valves, two outer wing tanks (if installed) with two three-position tank selector valves (if installed), two engine driven pumps, two electric booster pumps for engine starting and emergency operation, a priming system to aid in starting the engines, and firewall shut-off valves to cut off the flow of fuel to the engine during

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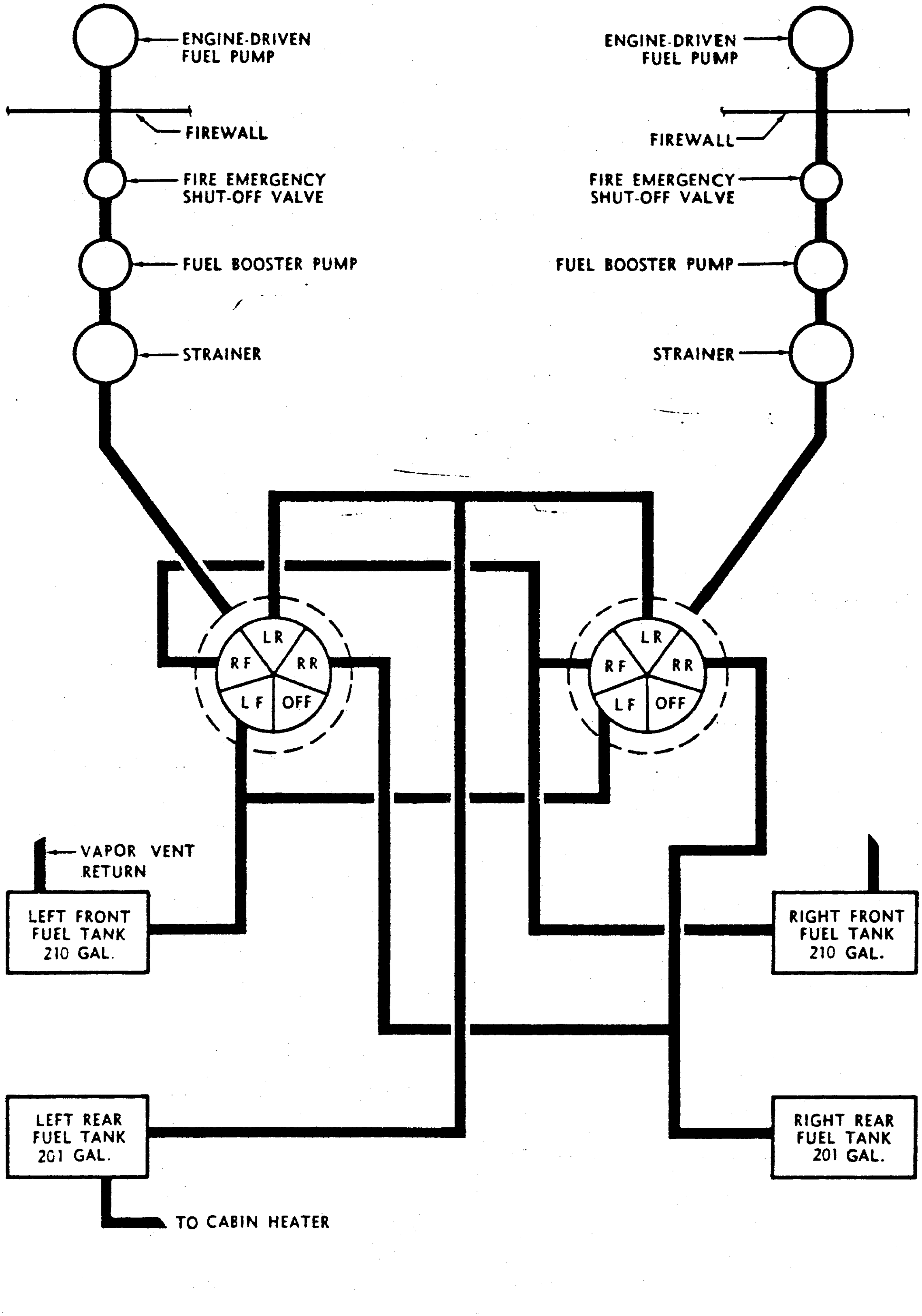

Figure A-3 - Fuel System

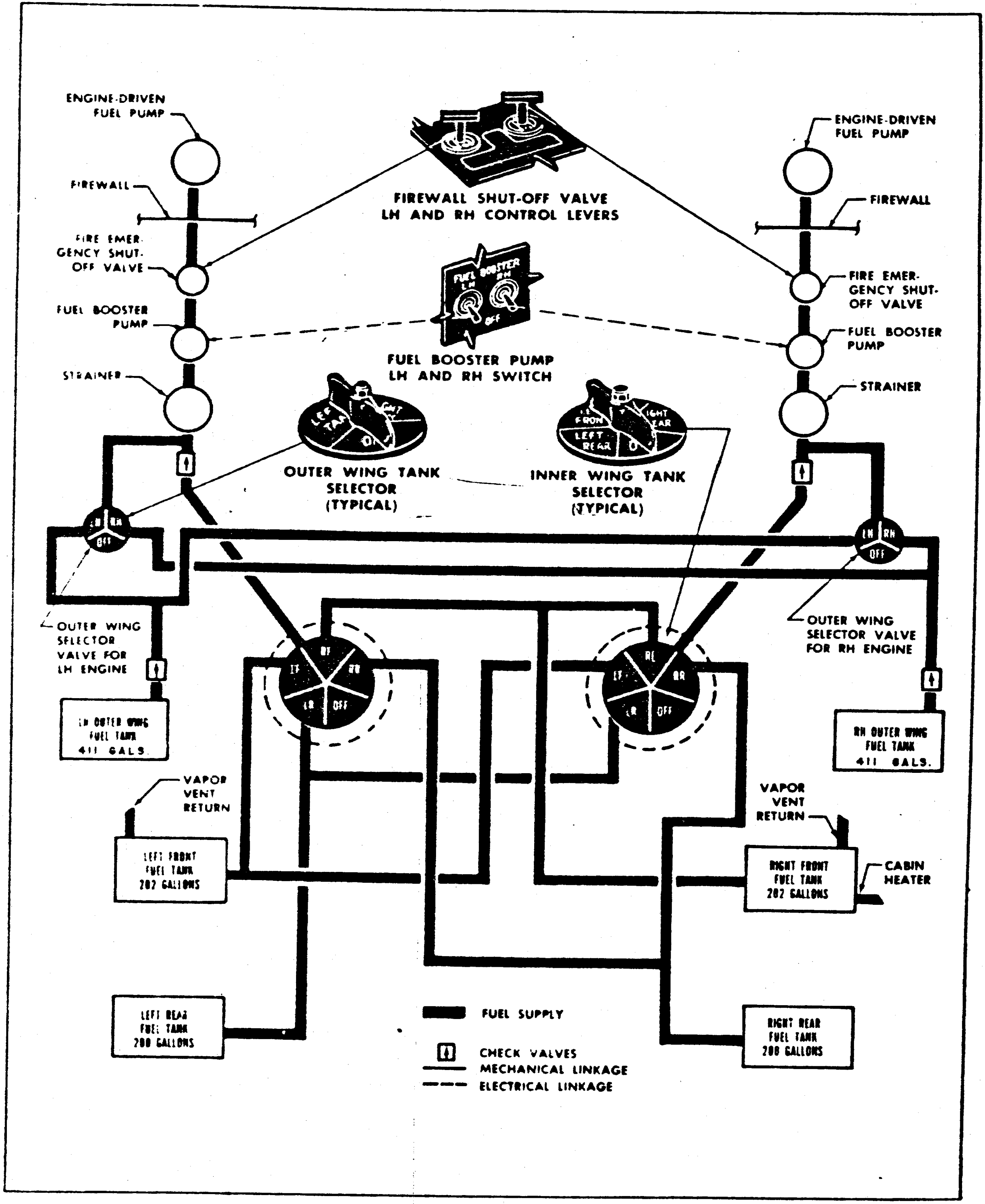

Figure 4-3 Fuel System

emergency conditions. While fuel may be supplied to either engine from any of the tanks, the system is considered to consist of two independent systems, one for each engine.

Each fuel tank is vented overboard and is suitable for the use of aromatic fuel. Each center wing front tank is connected to its respective engine carburetor by a vapor vent return line which will normally return approximately two gallons of fuel and vapor per hour from each carburetor, with a maximum flow of approximately 30 gallons per hour.

See Figure A-3 for fuel tank identification and capacities.

A-11-1. FUEL TANK SELECTOR VALVE CONTROLS. -- The two five-way fuel tank selector valves controls, mounted on the control pedestal, operate the two center wing tank selector valves located in the center wing, and are arranged so that the fuel from any center wing tank can be fed to either engine. These control valves have the following positions: "Off", "RR" (Right Rear), "LR" (Left Rear), "RF" (Right Front), and "LF" (Left Front). The outer wing tank selector valves are marked "Off", "Left Tank", and "Right Tank". They are so arranged that either engine may draw fuel from either outer wing tank.

A-11-2. FUEL BOOSTER PUMP CONTROLS. -- The fuel booster pump control switches are located on the right overhead electrical control panel. The switches are placarded "LEFT" and "RIGHT" and turn on the respective fuel booster pumps. The fuel booster pump circuits are classed as emergency circuits, and, as such, are not wired through a current limiter.

A-11-3. FUEL SYSTEM FIREWALL SHUT-OFF VALVE CONTROLS.-- The fuel system firewall shut-off valves are cable-operated from handles located under the access door on the floor between the pilot's and co-pilot's seats. In case of fire in the engine section, or any other condition requiring the stoppage of the flow of fuel to the engine, the corresponding handle should be pulled to shut off the flow of fuel, hydraulic fluid, and oil to that engine.

A-11-4. FUEL SYSTEM INDICATORS. -- The fuel system indicators consist of tank quantity indicators and fuel pressure indicators installed on the right section of the main instrument panel.

A-11-5. FUEL SYSTEM MANAGEMENT. -- The fuel system is designed so that each engine is provided with an independent fuel system, including its own fuel tanks, although fuel from any of the tanks may be directed to either engine by use of the fuel tank selector valve controls on the control pedestal. Transfer of fuel between tanks is not possible.

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A-12. OIL SYSTEM.

Lubricating oil is supplied to each engine by two independent identical oil systems, one in each engine section. Each oil system consists of a 29-gallon capacity oil supply tank, an engine-driven oil pump, an oil cooler with an inlet by-pass valve, a temperature regulator assembly, an electric actuator for the oil cooler air exit door control, and an emergency shut-off valve. Oil is also supplied to each propeller feathering system by means of a propeller feathering pump (see Figure A-4, Oil System).

A-12-1. OIL SYSTEM CONTROLS. -- Cooling of the lubricating oil is accomplished by an oil cooler mounted beneath each nacelle. The oil cooler can either be set to automatically maintain a pre-set temperature or can be manually varied to achieve a desired temperature limit. Both oil coolers are controlled by individual four-position switches on the left overhead electrical panel. The "AUTOMATIC" position allows the oil temperature regulators to automatically adjust each oil cooler air exit door to maintain a constant temperature. The "OPEN," "CLOSE," and "OFF" positions are used for manual operation of the air exit doors in the event that automatic operation is inadequate. The "OPEN" and "CLOSE" positions are spring-loaded; the "OFF" position will stop movement of the air exit door motor without coasting.

A-12-2. OIL SYSTEM INDICATORS. -- The oil system indicators consist of two oil pressure indicators and two oil temperature indicators installed on the right section of the main instrument panel.

A-12-3. OIL SYSTEM FIREWALL SHUT-OFF VALVE CONTROLS. -- The oil system firewall shut-off valves are cable-operated from handles located under the access door on the floor between the pilot's and co-pilot's seats. In case of fire in the engine section, the corresponding handle is pulled, which shuts off the fuel, hydraulic, and oil systems to that engine.

A-13. HEATING AND VENTILATING SYSTEM.

The cabin and cockpit areas are supplied with heated or with ambient ventilating air and the windshield is maintained in an ice-free condition by a single 150,000 Btu combustion heater, located beneath the forward cabin floor. Combustion and ventilating air is supplied in flight through a single duct in the fuselage nose - the duct is equipped with a check valve that is normally open whenever ram air is available. On the ground, the check valve closes for ground blower operation. The valve is

Reference — Douglas drawings 5132099
5371586, 5372314, and 5390262

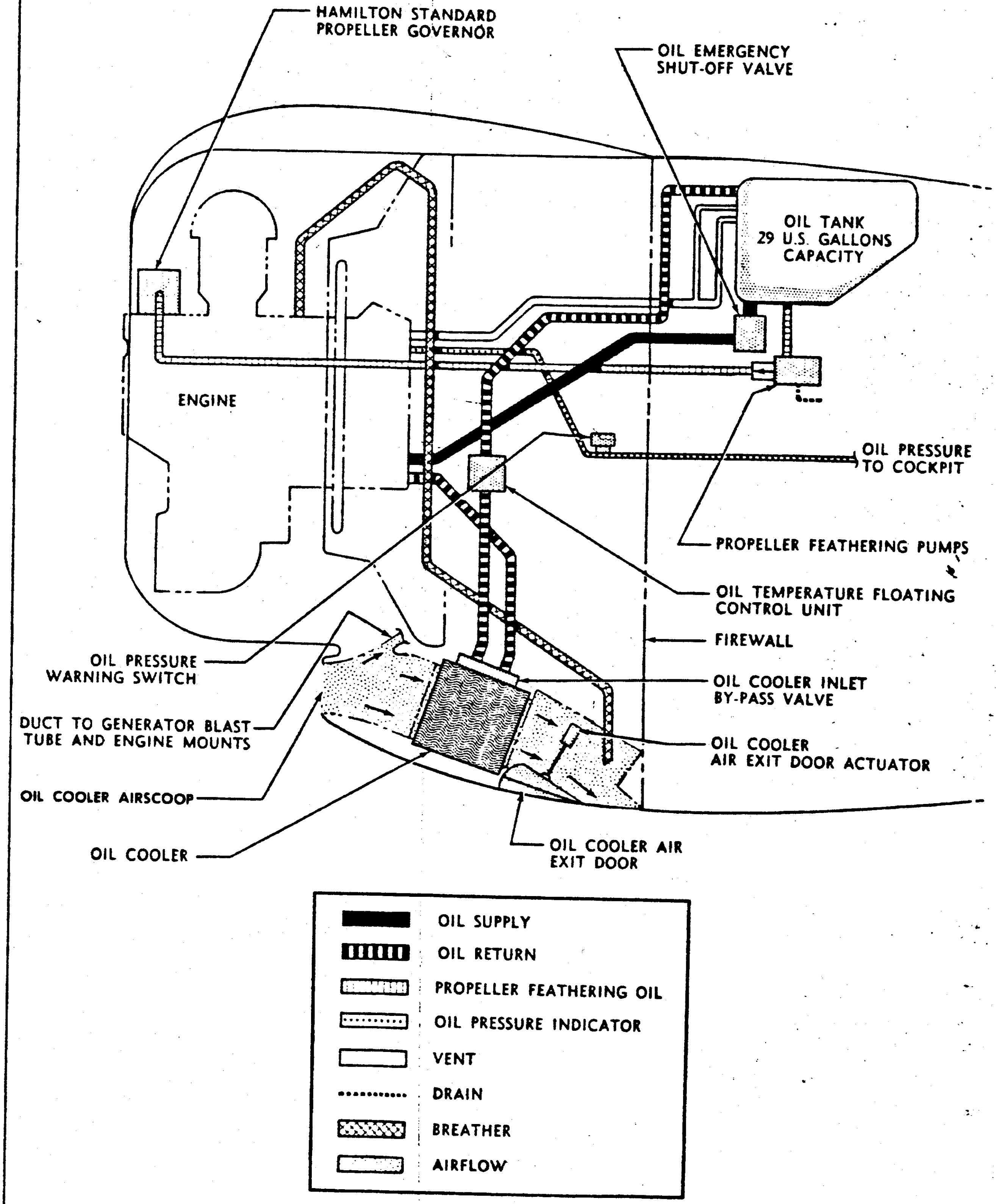

Figure A-4 - Oil System

equipped with a manual override to close off the supply of ram air in flight when the heater is inoperative. A ground blower is installed to provide air for heater operation on the ground. The temperature of the heated air delivered to the cockpit and cabin is controlled by two mixing valves - one for the cockpit and one for the main cabin. The heater is protected against excessive temperatures by a cycling switch and a drop-out switch. Fuel is supplied to the combustion heater from the left rear fuel tank (see Figure A-5, Heating, Ventilating, and Thermal Anti-Icing System).

A-13-1. HEATER GROUND BLOWER. -- A ground blower is installed to provide both heater combustion and ventilating air for ground operation of the heating and ventilating system. The ground blower will automatically operate when the landing gear safety switch is energized and the master battery switch is positioned to the applicable power source, and when either an external power source is connected to the airplane or when both engines are operating above the generator cut-in speed (approximately 800 rpm). No separate manual control is provided for the ground blower. The ground blower must be operating when using ground air conditioning equipment to avoid burning out the ground blower motor brushes.

A-13-2. CABIN HEATER SWITCH. -- The cabin heater "ON-OFF" switch on the left overhead electrical panel is the only control provided for the heater. The switch serves to energize both the heater ignition system and the heater fuel pump only if the ram air duct shut-off valve control is open (warning light off).

A-13-3. CABIN AIR MANUAL CONTROL. -- The temperature of the main cabin can be controlled by varying the ratio of cold and heated air as selected by the single cabin air manual control, located on the floor to the right of the cabin-to-cockpit door. The manual control is a push-pull lever incorporating a knob for locking the lever in position. A placard of operating instructions is mounted adjacent to the control.

A-13-4. COCKPIT AIR MANUAL CONTROL. -- The cockpit air manual control, located on a box aft of the co-pilot's seat, is identical in operation to the cabin air manual control.

A-13-5. MANUAL OVERRIDE VENTILATING AIR INTAKE CONTROL. -- A check valve, located in the ram air duct ahead of the heater, can be closed by a lever located aft of the co-pilot. The check valve can be used during flight when the heater is not operating to shut off ram air. If the valve is closed, a heater inoperative light on the main

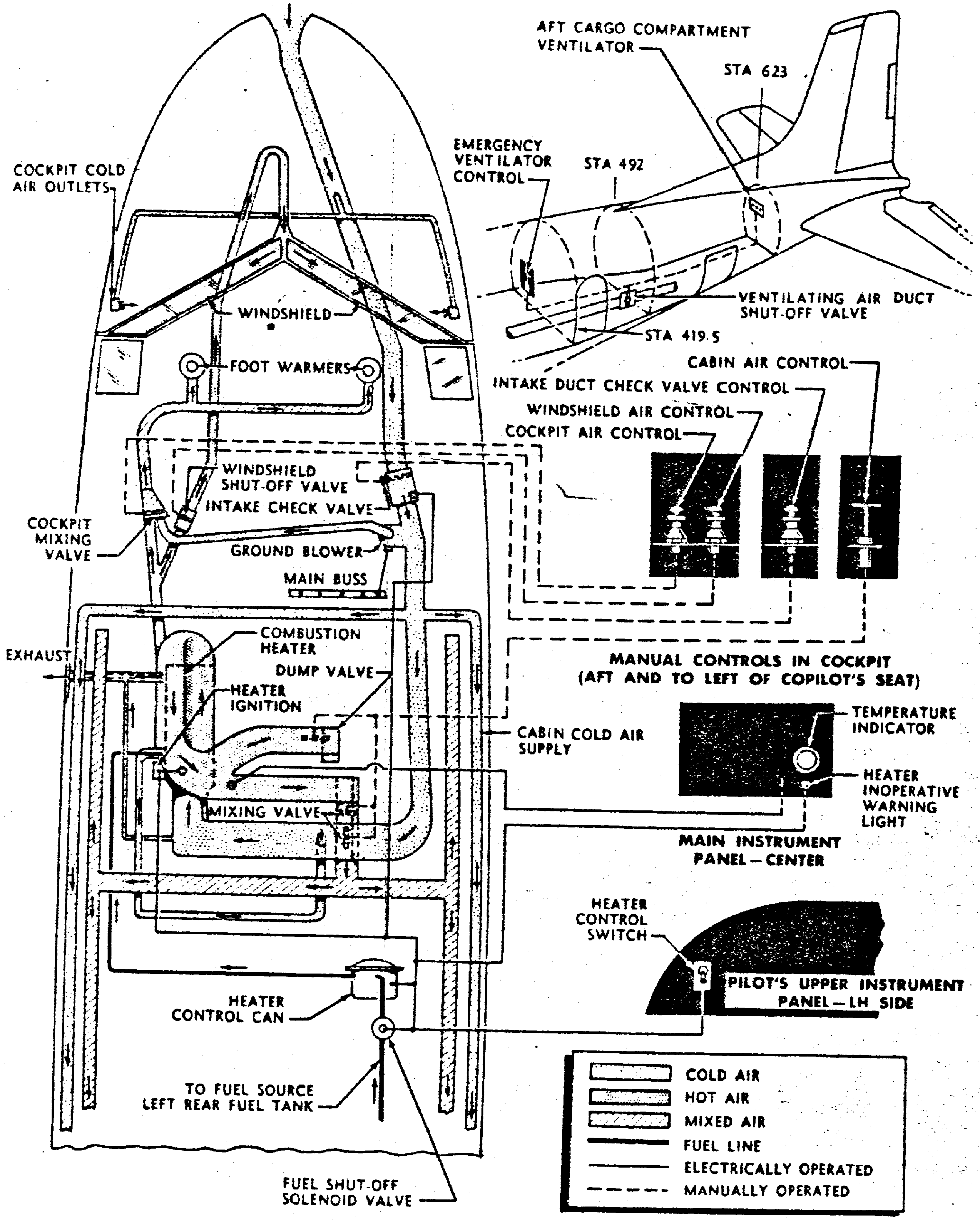

Figure A-5 - Heat., Vent., and Thermal Anti-Icer System

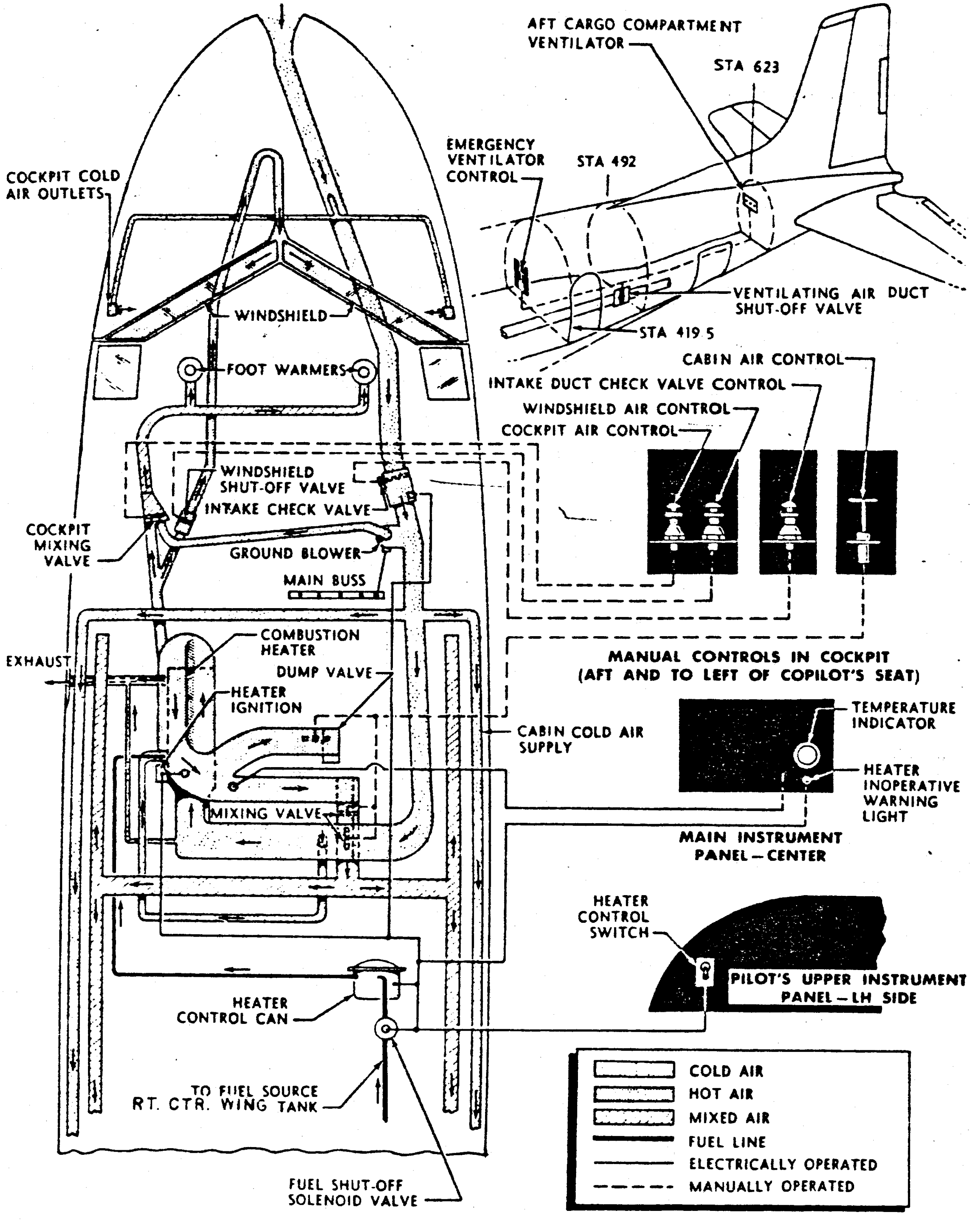

Figure A-5 - Heat., Vent., and Thermal Anti-Icer System

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instrument panel will illuminate when the heater switch is turned "ON," and the heater ignition and fuel circuits are de-energized.

A-13-6. HEATING AND VENTILATING SYSTEM INDICATORS. -- A heater temperature gage is mounted on the center section of the main instrument panel and registers heater discharge temperature. A heater inoperative light is mounted below the temperature gage to indicate when the ram air duct valve is closed or when the drop out fuse in the heater electrical circuit has blown and the heater fuel pump and heater ignition is de-energized.

A-13-7. HEATER PROTECTIVE SWITCHES. -- A cycling switch is installed in the downstream duct of the heater to cycle the heater fuel pump solenoid shut-off valve to maintain a constant heater discharge temperature. A drop-out switch is also installed downstream of the heater to shut the heater off in the event that the cycling switch should fail and the discharge temperature should reach a critical limit. Tripping of the drop-out switch results in blowing out the heater drop-out fuse, which will illuminate the warning light and make any further heater operation impossible. The drop-out switch should only be replaced on the ground after the cause of failure has been determined and corrected.

A-14. EMERGENCY VENTILATOR (IF INSTALLED).

An emergency ventilator is installed in the aft cargo compartment of some airplanes to provide increased ventilation of the area if normal ventilating is inadequate. The ventilator consists of adjustable louvers mechanically controlled by a lever located on the cabin floor at the cabin attendant's station. Pulling the lever to the open position also operates a valve in the main ventilating air duct to shut off the supply of ventilating air to the aft cargo compartment.

A-15. SURFACE DE-ICER SYSTEM.

Conventional, air-inflated de-icer shoes remove ice that has formed on the leading edges of the wing and tail surfaces. Pressurized air for the operation of the system is supplied by the discharge of the vacuum pumps. Air from the vacuum pumps passes through individual oil separators, a pressure regulating oil separator, and on to a cycling distributor valve which directs the flow of air to the de-icer shoes. The oil separators remove the small amounts of engine oil which the air picks up at the vacuum pumps. No restrictions are placed on the operation of the surface de-icer system with the exception of take-off and landing operating, when the system must be "OFF" to pre-

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vent undesirable aerodynamic characteristics.

A-15-1. SURFACE DE-ICER SYSTEM CONTROL. -- The de-icer shoes are controlled by the "ON-OFF" surface de-icer control, located on the lower aft face of the control pedestal.

A-15-2. SURFACE DE-ICER SYSTEM INDICATOR. -- The surface de-icer system indicator consists of a de-icer system pressure gage mounted on the right section of the main instrument panel. The indicator registers the pounds of air pressure being supplied by the vacuum pumps.

A-16. ACCESSORY ANTI-ICING SYSTEMS.

The accessory anti-icing systems prevent the formation of ice on the propeller blades, in the carburetor throat, in the pitot tubes, in the airscoops, and on the windshields. The propeller and carburetor anti-icing system uses anti-icing fluid pumped from a supply tank to each unit. Electrical resistance-type heaters eliminate ice formations from the pitot tubes and airscoop. Heated air is ducted to the windshields for ice elimination.

A-16-1. WINDSHIELD ANTI-ICING CONTROL. -- The double-paned windshield is protected against ice accretion by heated air, supplied by the cabin heater, which is passed between the inner and outer panes and exhausted into the cockpit. The degree of heat is regulated by the windshield heat control mounted on the cockpit floor behind the co-pilot's seat. The windshield temperature should be checked occasionally when heat is being applied to make certain that it is not too hot. The Vinyl content of the windshield is maintained in a birdproof condition at temperatures below 10°C OAT by applying just sufficient heat to cause the inner pane to feel warm to the hand.

A-16-2. ALCOHOL ANTI-ICING SYSTEM CONTROLS. -- Four alcohol anti-icing system controls, one for each carburetor and propeller, are installed on a panel located to the right of the co-pilot. An "ON-OFF" toggle switch on top of the panel is used for the operation of the alcohol pump. The two carburetor controls are "ON-OFF" controls, the flow of alcohol to the carburetor being pre-set and non-variable. The two propeller anti-icer controls are metering-type, and the volume of flow can be varied as conditions require. The maximum flow of alcohol is 30 gallons per hour.

A-16-3. PITOT AND AIRSCOOP HEATER CONTROLS. -- The electrical resistance-type heaters for the pitot tubes and the ram airscoop are controlled by a single "ON-OFF" toggle switch, located on the right overhead electrical control

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panel. Current flow to each of the heaters is indicated on an ammeter mounted adjacent to the control switch. An ammeter selector switch may be used to select the heater ammeter reading desired.

A-17. ELECTRICAL SYSTEM.

The 24-to-28-volt basic electric system is a single-wire type, in which the airplane's structure is used for the ground return. D-c power is delivered to the main electrical bus by two engine-driven generators in parallel and by two 12-volt batteries connected in series. An external receptacle permits the introduction of power from a ground source into the main bus when the engines are inoperative. Each generator is connected to the main bus through a system of protective devices (see Figure A-6), which is so designed that if a short occurs in either generator supply line, the faulty generator system will automatically be disconnected from the main distribution bus. Either generator alone is capable of supplying the power requirements of the airplane.

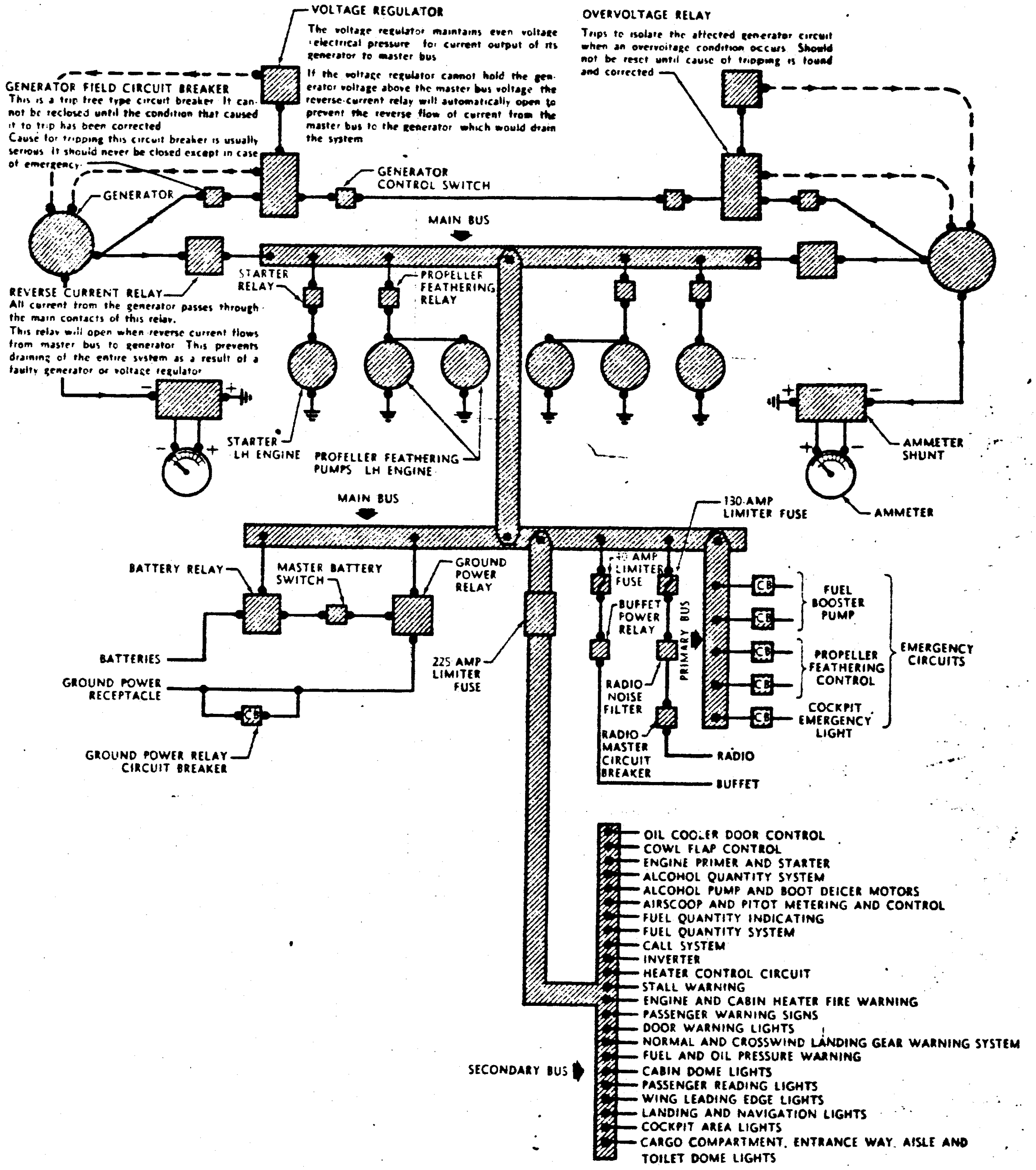
A-c power is supplied by two rotary-type inverters, either of which is capable of supplying the entire 115-volt, 400-cycle a-c load for instrument and electronic equipment operation.

A-17-1. GENERATOR SWITCHES. -- Each generator is connected to and disconnected from the main electrical bus system by an "ON-OFF" switch on the right overhead electrical panel. Each switch should be turned "ON" after the respective engine has been started. If an engine must be started without an external power source, the generator switch for the engine first started should be turned "ON" immediately after the start, and, after the engine has warmed up sufficiently, the engine should be run up in excess of 800 rpm to generate sufficient power to start the remaining engine.

In addition to the generator control switch, two generator field circuit breakers, one for each generator, are located on the main circuit breaker panel. Each circuit breaker will trip under an excessive field current flow and disconnect the generator from the bus.

A-17-2. MASTER BATTERY SWITCH. -- The two-position master battery switch, mounted on the right overhead electrical panel, serves to connect either the airplane's batteries or an external power supply to the main bus. The switch positions are "AIRPLANE BATTERY" and "GROUND POWER."

A-17-3. INVERTER SWITCH. -- Either of the two inverters is placed into operation by the "LEFT-OFF-RIGHT" inverter switch on the right overhead electrical panel. While no inverter warning light, as such, is provided, a light will



VOLTAGE REGULATOR

The voltage regulator maintains even voltage (electrical pressure) for current output of its generator to master bus

If the voltage regulator cannot hold the generator voltage above the master bus voltage the reverse-current relay will automatically open to prevent the reverse flow of current from the master bus to the generator which would drain the system

OVERVOLTAGE RELAY

Trips to isolate the affected generator circuit when an overvoltage condition occurs. Should not be reset until cause of tripping is found and corrected

GENERATOR FIELD CIRCUIT BREAKER

This is a trip free type circuit breaker. It cannot be reclosed until the condition that caused it to trip has been corrected

Cause for tripping this circuit breaker is usually serious. It should never be closed except in case of emergency

REVERSE CURRENT RELAY

All current from the generator passes through the main contacts of this relay.

This relay will open when reverse current flows from master bus to generator. This prevents draining of the entire system as a result of a faulty generator or voltage regulator

Figure A-6 - Main Power Distribution Schematic

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illuminate on the ADF control panel if an inverter fails, or when the master battery switch is positioned to either power source and the inverter switch is "OFF."

A-18. VACUUM SYSTEM.

The vacuum system, installed to provide the negative pressure required to operate the turn and bank indicator, the directional gyro, and the gyro horizon, consists basically of a vacuum pump on each engine, a vacuum pump selector valve, a suction gage, a pressure warning light, and an adjustable throttle valve to reduce the normal system pressure for suitable operation of the turn and bank indicator. The exhaust side of the vacuum pumps is used to operate the surface de-icer system. Relief valves are installed in the system pre-set to relieve when the negative pressure exceeds 4 (±.2) inches Hg.

A-18-1. VACUUM PUMP SELECTOR VALVE CONTROL. -- Either engine-driven vacuum pump can be selected to provide negative pressure to the vacuum system by means of the vacuum pump selector valve control on the right section of the main instrument panel. (While both vacuum pumps operate continuously, only one pump at a time can supply negative pressure to the system.) In the event of the failure of one engine, the vacuum pump selector valve control should be positioned to the opposite engine.

A-18-2. THROTTLE VALVE AND TURN AND BANK SELECTOR VALVE CONTROLS (IF INSTALLED). -- On some airplanes, an adjustable throttle valve control is mounted on the center section of the main instrument panel to provide a means of reducing the normal vacuum system pressure to 2 (±.2) inches Hg, as required for the operation of the turn and bank indicator. A turn and bank selector valve control is mounted adjacent to the throttle valve control to provide a means of reading the turn and bank indicator negative pressure on the vacuum system gage. If the reading on the gage varies from 2 (±.2) inches Hg, the throttle valve control should be adjusted to attain this reading. The normal position of the turn and bank selector valve control is "SPERRY."

A-18-3. VACUUM SYSTEM INDICATORS. -- A suction gage, mounted on the center section of the main instrument panel, provides indication of the vacuum system pressure and is calibrated in inches Hg. A vacuum system warning light, mounted adjacent to the suction gage, will illuminate when the vacuum system pressure drops below a reliable operating pressure. If the warning light illuminates, the vacuum pump selector valve control must be positioned to the opposite pump.

A-19. PITOT-STATIC SYSTEM.

A pitot (ram) and a static pressure system, installed for operation of the airspeed, altimeter, and rate-of-climb instruments, consists of two pitot tubes in the fuselage nose, a pitot line purging pump, both a main and an icefree alternate static source, and a static selector valve. The pitot tubes are protected against ice accretion by internal electric heating elements.

A-19-1. PITOT SYSTEM PURGING PUMP AND PUMP CONTROL VALVE (IF INSTALLED). -- On some airplanes, the left pitot ram air pressure line, supplying pressure to the main airspeed indicator on the center section of the main instrument panel, can be purged of any moisture condensate by means of a hand-operated purging pump located on the left section of the main instrument panel. A "PUMP-AIRSPEED" purging pump control valve is mounted adjacent to the pump. To purge the line, position the control valve handle to "PUMP," and operate the purge pump handle through a few cycles. The purging pump control valve handle must be positioned to "AIRSPEED" at all times that the pitot line does not require purging.

A-19-2. STATIC SYSTEM SELECTOR VALVE CONTROL. -- The static system selector valve control, mounted on the center section of the main instrument panel, is provided to select either the main static source or the alternate icefree static source in the tail section.

A-20. COMMUNICATIONS EQUIPMENT.

The radio and navigational equipment is used for communication, for navigation, and for altitude indication. The equipment is installed in the radio rack located on the left side of the airplane immediately aft of the cockpit. The equipment consists of an HF transmitter-receiver, a VHF transmitter-receiver, an automatic radio compass, marker beacon indicator lights and receiver, localizer and glide path receivers, and an interphone system. The controls for the equipment are installed above the overhead electrical control panels on the ceiling, outboard of the pilot and co-pilot, on the aft side of the control pedestal, and at the cabin attendant's station. Operation of the communications, navigational, and interphone equipment is conventional.

A-21. OXYGEN SYSTEM.

A high-pressure, manually operated, emergency oxygen system of the demand type is installed for the crew and passengers. The system has sufficient capacity to maintain flow requirements for the three crew members and the

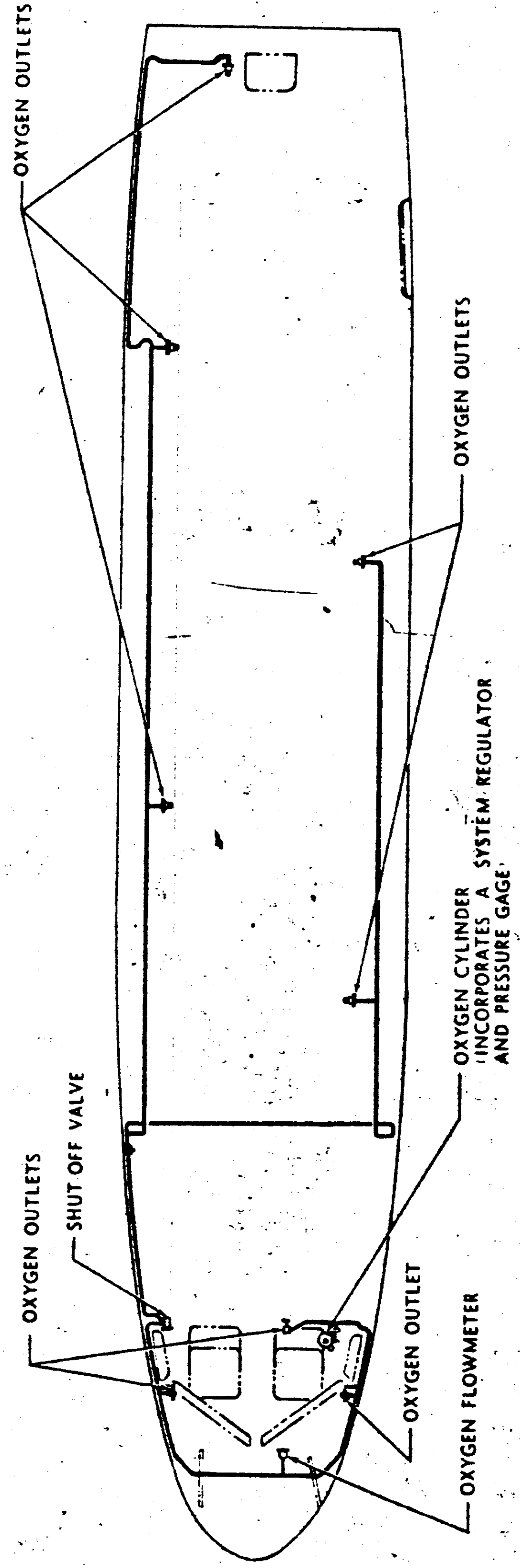

Figure A-7 - Oxygen System

four passenger outlets for 35 minutes at an altitude of 14,000 feet. The oxygen outlets are connected to one high-pressure oxygen cylinder, located on the left side of the airplane aft of the pilot's seat. A shut-off valve, located behind the co-pilot's seat, is provided to shut off the flow of oxygen to the passenger compartment outlets, thus permitting all of the oxygen to be available to the flight crew in cases of extreme emergency (see Figure A-7, Oxygen System).

A-21-1. OXYGEN REGULATOR. -- An oxygen regulator is mounted on the oxygen cylinder. The regulator must be manually adjusted by a crew member to supply oxygen in accordance with physiological requirements and the airplane's altitude.

A-21-2. OXYGEN PRESSURE GAGE. -- An oxygen cylinder pressure gage is incorporated with the oxygen regulator at the cylinder. The gage registers the amount of oxygen available, in pounds per square inch pressure, for use.

A-21-3. OXYGEN FLOW GAGE. -- An oxygen flow gage (flowmeter), installed on the left section of the main instrument panel, is calibrated in thousands of feet of altitude. A check of the gage reading against the airplane altimeter reading ensures that oxygen at proper pressure is being supplied to the distribution lines.

A-22. FIRE EXTINGUISHER SYSTEM.

The airplane is equipped with a two-shot, mechanically controlled, CO_2 fire extinguisher system for the extinguishing of fires in the nacelles and in the cabin heater compartment. Two portable CO_2 fire extinguishers are provided to extinguish fires in the cockpit and cabin and in the baggage compartments.

A-22-1. FIRE EXTINGUISHER CONTROLS. -- The fire extinguisher system controls, located under an access door on the floor between the pilot and co-pilot seats, consist of a selector valve, for directing the flow of CO_2 into the desired area; two emergency fluid shut-off valves, for shutting off the supply of fuel, oil, and hydraulic fluid at the firewall of the affected nacelle; and two CO_2 discharge handles, which release the CO_2 gas into the area pre-selected by the selector valve.

A-22-2. FIRE DETECTOR SYSTEM. -- Fires in the CO_2-protected area are indicated by the fire detector system, consisting of dual fire warning lights mounted on the main instrument panel for the "L.H. ENG." and "R.H. ENG.," and on the left overhead electrical panel for the cabin heater; a warning bell; thermocouple and thermo-switch type fire detectors; a circuit testing installation; and the necessary circuits

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and relays.

The red warning lights and the alarm bell are automatically turned on by the fire detector system to signal the outbreak of a fire in the nacelle or engine section, or in the cabin heater compartment. The testing installation provides a means of checking the operation of any detector circuit. For fire control procedures, see Section II, Emergency Operation.

A-23. PYROTECHNICS.

The airplane is equipped with an emergency landing-flare system for illuminating landing areas. Two parachute flares are installed in two containers, located in the tail. The flares are released by a cable system operated by two release handles located at the ceiling in the passageway, immediately aft of the cockpit. Pulling either handle releases a flare, permitting it to drop and puncture the protective paper seal at the lower opening of the chute. The flare burns for a minimum of three minutes with a light intensity of 300,000 candle power. From an altitude of 2500 feet, this is sufficient light to illuminate a ground area of one and three-quarter square miles. The parachute is designed so that the flare will descend at a rate not exceeding 550 feet per minute.

A-24. STALL WARNING SIGNAL.

A stall warning signal, consisting of a warning light on the main instrument panel and a pulsating-tone horn behind the pilot, warns that the airspeed has been reduced below a safe operating level. The light and horn are actuated by a vane-type switch aerodynamically located on the leading edge of the right outer wing panel. The vane-type switch itself is energized by air flow reversal as a result of reduced airspeed. The stall warning system is de-energized when the airplane is on the ground.