



# ALL WEATHER OPERATION

## section IX

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### INTRODUCTION

This Section discusses special all weather procedures and techniques which either emphasize or add to procedures and techniques presented in Sections II and III. Flying the airplane in all weather conditions requires normal instrument flight proficiency on the part of the pilot as well as the usual conscientious preflight planning. A standard operating procedure should be employed by the pilot and copilot during instrument takeoff and instrument approach. Power adjustments may be made by the copilot, at the direction of the pilot, which will permit the pilot to concentrate on instrument flying. The airplane is fully equipped for instrument flight. Performance data, as well as techniques and procedures, included in this all weather section are based on standard production model airplanes.

### INSTRUMENT FLIGHT PROCEDURES

#### TAKEOFF

**WARNING**

In cold weather, make sure all instruments have warmed up sufficiently to ensure normal operation. Check for sluggish instruments during taxiing.

1. Align the airplane on the runway. Hold the brakes. Recheck attitude indicators for proper setting and set heading indicator so that appropriate runway heading and heading pointer are under the top index. Advance throttles smoothly to field barometric pressure.

2. Release the brakes at field barometric pressure (in. Hg MAP) and advance throttles smoothly to maximum power. During the ground run and initial climb, the copilot should be prepared to give verbal correction from visual reference to the runway and ground.
3. At ten knots below takeoff speed, initiate a pitch change of approximately two bar widths indication on the J-8 attitude indicator or ten degrees on the MM series attitude indicator. With this attitude, the airplane should fly off the ground at the computed takeoff speed.
4. When definitely airborne, as indicated by the altimeter and vertical velocity indicator, retract the landing gear and follow the normal climb procedure.

**Note**

A slight nose heaviness is apparent momentarily while the landing gear is retracting.

**WARNING**

After takeoff, the TACAN should be cross checked with ground radar, airborne radar, or VOR. When using TACAN for instrument departures or letdowns, utilize airborne radar monitor or ground monitor when possible to verify TACAN bearing information.

**SINGLE-ENGINE OPERATION**

The approved procedure for single-engine operation is stated in Section III. The critical relationship between wing flaps and airspeed during instrument takeoff must be thoroughly understood. If the airplane is allowed to fly off the ground, sufficient airspeed is generally attained prior to gear retraction to allow flap retraction without developing a dangerous situation. In the event of engine failure on takeoff, after sufficient airspeed has been attained, a normal climb-out and instrument approach is practicable.

**CRUISE**

The airplane has excellent instrument handling characteristics through its normal speed range. It is recommended that turns be made with 25° angle of bank. Turns with much greater angle of bank can be made safely, but proportionately greater skill and concentration are required. The heading indicator is easiest to fly with the heading set under the index at the top of the case.

**HOLDING FLIGHT**

Upon arrival at the holding fix, adjust power as required to maintain 140 to 150 KIAS. For extended holding periods, rpm should be reduced. Refer to maximum endurance power settings in the Appendix. For descent in holding pattern, reduce power approximately 6 in. Hg and maintain same airspeed. Rate of descent will approximate 500 fpm. When

cleared for an approach, adjust power settings as recommended for a normal approach.

**Note**

Icing conditions which cause runback to reach the wing flaps and ailerons is considered heavy icing and should be avoided. When holding in icing conditions, in addition to maintaining adequate airspeed, use sufficient power to provide adequate leading edge temperatures. Close the augmentor vanes. Adjust nacelle flaps to maintain cylinder head temperature. Do not exceed MID-POSITION.

**DESCENT**

Normal descent or radar controlled descent to traffic altitude can be made with cruising configuration and at cruising speed. Maintain cruising airspeed and reduce manifold pressure slightly more than one inch for each 100 fpm of descent desired; (approximately 6 in. Hg for a 500 fpm descent). To maintain the same rate of descent, reduce the manifold pressure approximately one inch with each 1000-foot loss of altitude.

**Note**

Prior to descent through an overcast, apply carburetor heat and pitot heat as required. In precipitation, start windshield wiper operation before reaching final approach.

**INSTRUMENT APPROACHES**

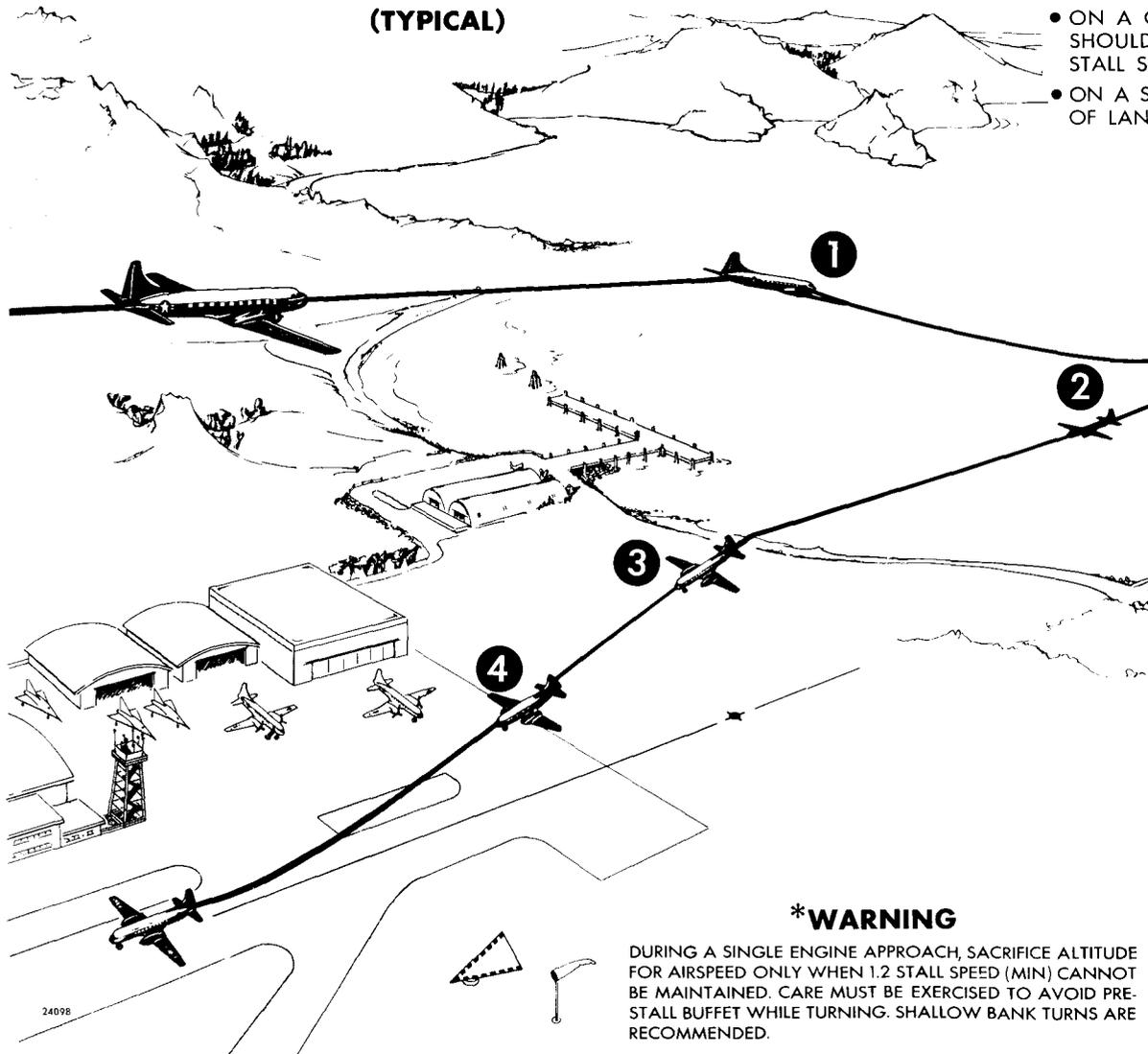
This airplane is equipped for performing most types of instrument approaches, and no special techniques are required. To determine instrument landing minima, this aircraft is a B approach category aircraft. Letdowns in the clean configuration or with wing flaps and landing gear extended are at the discretion of the pilot. However, items of airplane configuration are to be initiated normally not later than outlined in figures 9-1, 9-2, or 9-3. If it is necessary in an emergency to make an instrument landing, the rate of descent during the last 100 feet should be adjusted to less than 500 fpm. This will bring the nose up slightly, and a landing will be made on the main wheels.

**WARNING**

During TACAN and VOR instrument approaches, the spare inverter warning light must be monitored and all navigational aid instruments cross checked for proper indication. In the event of failure of the spare inverter or main inverter, the TACAN and VOR will be unreliable.

# NORMAL AND SINGLE ENGINE RADIO RANGE, ADF, VOR AND TACAN APPROACH

(TYPICAL)



## NOTE

- THIS IS A TYPICAL DIAGRAM WHICH IS NOT MEANT TO SHOW THE INTENDED FLIGHT PATH BUT DOES INDICATE A CHRONOLOGICAL ORDER FOR THE ITEMS TO BE PERFORMED. THESE ITEMS MAY BE PERFORMED BEFORE, BUT NORMALLY NOT LATER THAN THE POINT INDICATED ON THE DIAGRAM.

REFER TO APPENDIX FOR FLAP SETTINGS AND AIRSPEEDS AT VARIOUS GROSS WEIGHTS.

- ON A CIRCLING APPROACH, THE LANDING GEAR SHOULD BE LOWERED ON BASE LEG. MAINTAIN 1.4 STALL SPEED (MIN) UNTIL ON FINAL APPROACH.
- ON A SINGLE ENGINE APPROACH, DELAY EXTENSION OF LANDING GEAR UNTIL LANDING IS ASSURED.

### 1. INITIAL STATION PASSAGE

- DESCENT CHECK—COMPLETED
- RPM—AS REQUIRED (SINGLE ENGINE METO)
- WING FLAPS—AS REQUIRED
- \*IAS—1.4 STALL SPEED (MIN)

### 2. APPROACHING FINAL APPROACH FIX

- RPM—2400 (SINGLE ENGINE METO)
- WING FLAPS—APPROACH SETTING (SINGLE ENGINE—AS REQUIRED)
- \*IAS—1.3 STALL SPEED (MIN)

### 3. FINAL APPROACH FIX

- LANDING GEAR—DOWN & LOCKED
- WATER—ON
- PROPELLER—(SINGLE ENGINE)—HIGH LIGHT
- \*IAS—1.3 STALL SPEED (MIN)
- BEFORE LANDING CHECK—COMPLETED

### 4. LANDING ASSURED

- PROPELLERS—HIGHLIGHTS
- WING FLAPS—LANDING SETTING
- \*IAS—1.3 STALL SPEED (MIN)

## \*WARNING

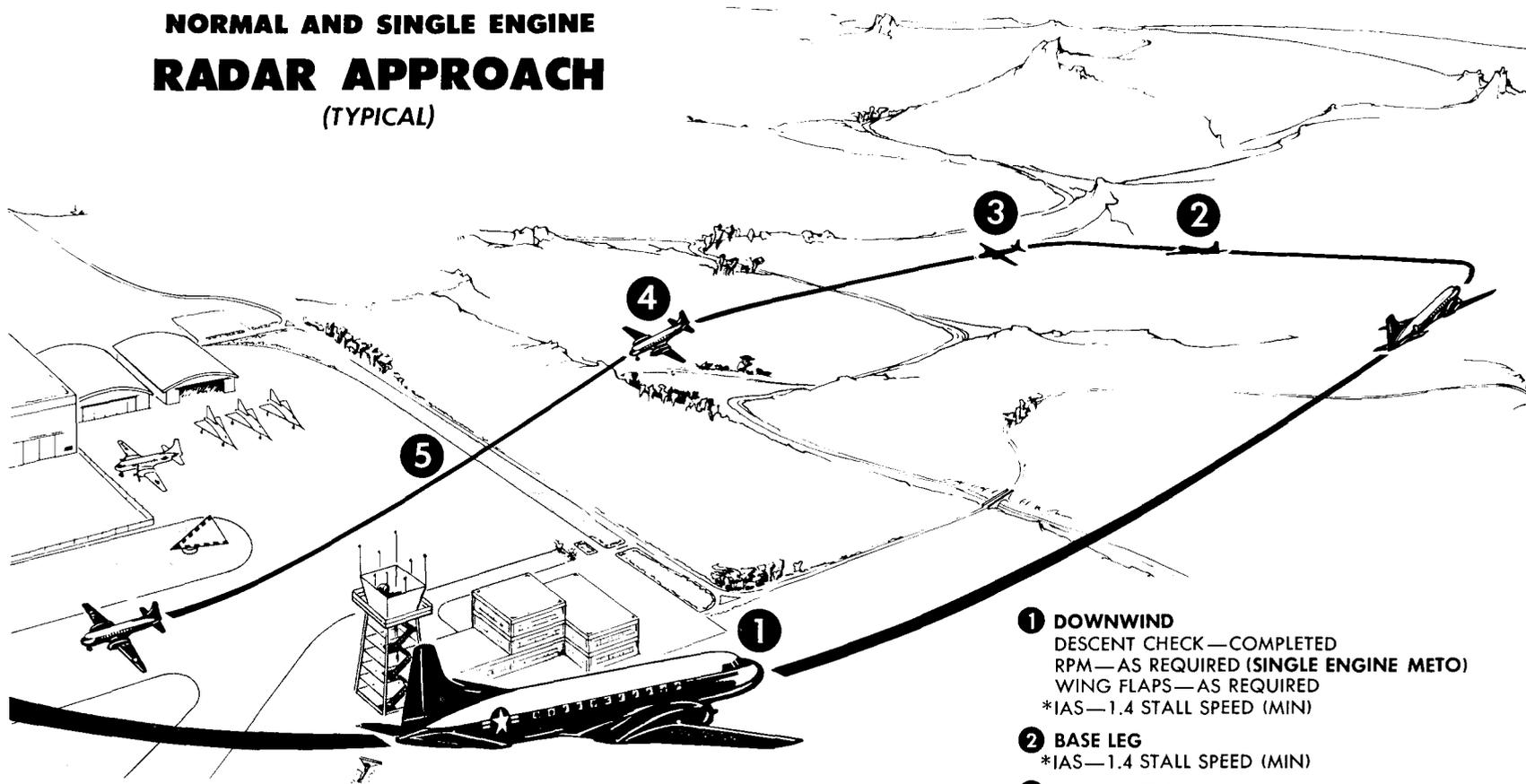
DURING A SINGLE ENGINE APPROACH, SACRIFICE ALTITUDE FOR AIRSPEED ONLY WHEN 1.2 STALL SPEED (MIN) CANNOT BE MAINTAINED. CARE MUST BE EXERCISED TO AVOID PRE-STALL BUFFET WHILE TURNING. SHALLOW BANK TURNS ARE RECOMMENDED.

Figure 9-1

Change 1 9-3

24098

# NORMAL AND SINGLE ENGINE RADAR APPROACH (TYPICAL)



## \*WARNING

DURING A SINGLE ENGINE APPROACH, SACRIFICE ALTITUDE FOR AIRSPEED ONLY WHEN 1.2 STALL SPEED (MIN) CANNOT BE MAINTAINED. CARE MUST BE EXERCISED TO AVOID PRE-STALL BUFFET WHILE TURNING. SHALLOW BANK TURNS ARE RECOMMENDED.

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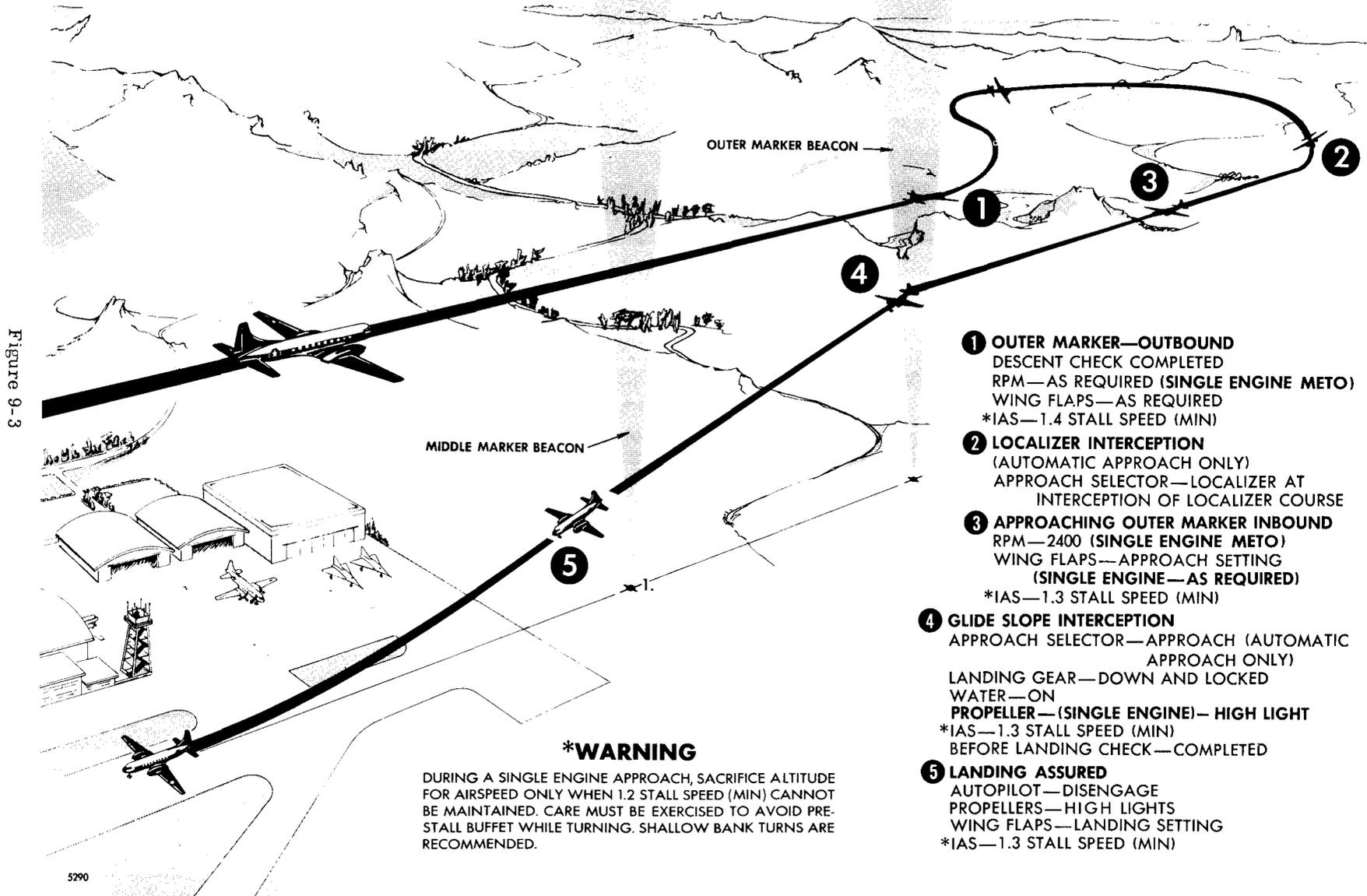
- 1 DOWNWIND**  
DESCENT CHECK—COMPLETED  
RPM—AS REQUIRED (SINGLE ENGINE METO)  
WING FLAPS—AS REQUIRED  
\*IAS—1.4 STALL SPEED (MIN)
- 2 BASE LEG**  
\*IAS—1.4 STALL SPEED (MIN)
- 3 FINAL APPROACH**  
RPM—2400 (SINGLE ENGINE METO)  
WING FLAPS—APPROACH SETTING  
(SINGLE ENGINE—AS REQUIRED)  
\*IAS—1.3 STALL SPEED (MIN)
- 4 GLIDE SLOPE INTERCEPTION**  
LANDING GEAR—DOWN & LOCKED  
WATER—ON  
PROPELLER—(SINGLE ENGINE)—HIGH LIGHT  
\*IAS—1.3 STALL SPEED (MIN)  
BEFORE LANDING CHECK—COMPLETED
- 5 LANDING ASSURED**  
PROPELLERS—HIGH LIGHTS  
WING FLAPS—LANDING SETTING  
\*IAS—1.3 STALL SPEED (MIN)

Figure 9-2

# NORMAL AND SINGLE ENGINE ILS APPROACH (TYPICAL)

## NOTE

- THIS IS A TYPICAL DIAGRAM WHICH IS NOT MEANT TO SHOW THE INTENDED FLIGHT PATH BUT DOES INDICATE A CHRONOLOGICAL ORDER FOR THE ITEMS TO BE PERFORMED. THESE ITEMS MAY BE PERFORMED BEFORE, BUT NORMALLY NOT LATER THAN THE POINTS INDICATED ON THE DIAGRAM.
- REFER TO APPENDIX FOR FLAP SETTINGS AND AIRSPEEDS AT VARIOUS GROSS WEIGHTS.



- 1 OUTER MARKER—OUTBOUND**  
DESCENT CHECK COMPLETED  
RPM—AS REQUIRED (SINGLE ENGINE METO)  
WING FLAPS—AS REQUIRED  
\*IAS—1.4 STALL SPEED (MIN)
- 2 LOCALIZER INTERCEPTION**  
(AUTOMATIC APPROACH ONLY)  
APPROACH SELECTOR—LOCALIZER AT INTERCEPTION OF LOCALIZER COURSE
- 3 APPROACHING OUTER MARKER INBOUND**  
RPM—2400 (SINGLE ENGINE METO)  
WING FLAPS—APPROACH SETTING (SINGLE ENGINE—AS REQUIRED)  
\*IAS—1.3 STALL SPEED (MIN)
- 4 GLIDE SLOPE INTERCEPTION**  
APPROACH SELECTOR—APPROACH (AUTOMATIC APPROACH ONLY)  
LANDING GEAR—DOWN AND LOCKED  
WATER—ON  
PROPELLER—(SINGLE ENGINE)—HIGH LIGHT  
\*IAS—1.3 STALL SPEED (MIN)  
BEFORE LANDING CHECK—COMPLETED
- 5 LANDING ASSURED**  
AUTOPILOT—DISENGAGE  
PROPELLERS—HIGH LIGHTS  
WING FLAPS—LANDING SETTING  
\*IAS—1.3 STALL SPEED (MIN)

**AUTOMATIC ILS**

This airplane is equipped with an approach coupler which permits automatic ILS approaches. The only difference in the procedure employed between manual and automatic approaches is that the automatic pilot is used in the automatic approach. When contact flight conditions or minimum approach altitude is reached, the pilot disengages the autopilot and accomplishes a normal landing or missed approach. See figure 9-3.

**WARNING**

Glide slope and localizer indications must be monitored and the pilot prepared to assume manual control if the autopilot is not performing a satisfactory approach.

**CIRCLING APPROACH**

The circling approach will be made under contact flight conditions after completion of the instrument approach. Normally, the landing gear will not be extended until on base leg. While maneuvering into the landing position, the landing runway shall be kept in sight at all times. Maintain airspeed for approach flap setting (1.4 stall speed minimum). When on base leg, normal procedure will be used to complete the landing.

**ICE AND RAIN****ICING**

The airplane is equipped with the necessary wing and tail anti-icing, pitot heat, carburetor heat, propeller de-icing, and windshield anti-icing systems to enable it to fly with safety in light icing conditions as defined by Air Weather Service and the U.S. Weather Bureau.

**WARNING**

Avoid flight through moderate or heavy icing conditions.

Operation of the anti-ice and de-icing systems is described in Sections IV and VII. Additional information and specific procedures are given under COLD WEATHER PROCEDURES this section.

**WARNING**

Do not take off unless wing and tail surfaces are clear of all snow, ice, and frost. Airplane lift and control effectiveness will be seriously impaired unless these surfaces are clean.

**WING AND TAIL ANTI-ICING**

The wing and tail anti-icing system should be used for anti-icing rather than for de-icing. It is more

satisfactory in the physical results and is simpler in operation. For most efficient operation, always turn on and heat-soak the anti-icing system at least 30 minutes before entering an icing area. The purpose of the system is to produce enough heat in the wing and tail leading edges to evaporate most of the moisture or precipitation. Moisture which does not evaporate runs back over the surface of the wing and freezes over the cold area. This is called "runback." Presence of runback does not mean that the wing and tail anti-icing system is functioning improperly; however, the pilot should observe the total accumulation of ice on the airplane, including runback, and take corrective action to avoid continued icing.

**WARNING**

- Do not use the autopilot altitude control when operating in icing conditions. In trying to maintain a constant altitude in moderate or heavy icing, it may allow the airplane to gradually assume a nose-up attitude and allow dangerous amounts of ice to form on the underside of the wing and fuselage. Maintain as close to a "zero" angle of attack as possible by use of pitch trim and increased power application as necessary.
- Stall warning in the form of buffet will occur at higher airspeeds than normal when the airplane is weighted with accumulations of ice. The buffet warning zone is also narrower and stall will be encountered at higher airspeed than in normal conditions. Govern approach and landing speed accordingly.

**PITOT HEAT, PROPELLER DE-ICING, AND WINDSHIELD ANTI-ICING**

Propeller de-icing should be turned on as icing conditions are encountered. Use pitot heat as required. The windshield and direct-vision anti-icing systems will be turned on prior to flight and remain on during flight. The NESA glass windshield panels are efficient when the lowest power settings are used; however, if it becomes necessary to use high power, the windshield panels must be warmed up at least ten minutes on low power before full heat may be applied safely.

**CARBURETOR HEAT**

The carburetor may accumulate ice during flight in clouds and precipitation at or below freezing temperatures. In any cloud or moisture condition, with carburetor air temperatures of  $-10^{\circ}$  to  $+15^{\circ}\text{C}$ , or during any icing condition, use carburetor heat as necessary. See Section V for carburetor air temperature limitations.

**DIRECT-VISION WINDOWS**

Opening the direct-vision windows permits a visual landing in event the windshields are covered with ice. For best results it is necessary to lean as far to the side as possible. This directs considerable wind into the pilot's face. Under these circumstances it is difficult for the pilot to monitor his own airspeed indicator and it is advisable for the copilot to call out the airspeed to the pilot.

**WARNING**

It is possible for the direct-vision windows to interfere with the control column if the window stop is defective.

**TURBULENCE AND THUNDERSTORMS****CAUTION**

Avoid penetrating a thunderstorm if it is at all possible to fly around it.

**BEFORE TAKEOFF**

Make a thorough analysis of the general weather situation in order to plot thunderstorm areas. Prepare a flight plan which will require the least possible exposure of the airplane to regions of possible thunderstorms. Be sure to check proper operation of all flight instruments, navigation equipment, pitot heaters, and instrument panel lights before attempting flight into thunderstorm areas.

**APPROACHING THE STORM**

It is imperative that you prepare the airplane prior to entering a zone of turbulent air. If the storm cannot be seen, its proximity can be detected through use of radar.

**CAUTION**

On **A**, **B**, and **C** airplanes, when operating in or near thunderstorm activity, the trailing antenna should be retracted.

"Soft" spots can be located and an appreciable reduction in gust experience can be achieved by circumnavigation of radar echoes or, if this is not possible, by penetrating areas of least return. Normal preparatory procedures should be employed when there is a possibility of encountering thunderstorm activity. Prepare the airplane as follows:

1. Adjust power as necessary to obtain an air-speed of 60 KNOTS ABOVE STALL SPEED for weight and configuration being flown.
2. Pitot heat switch ON.
3. Wing and tail, windshield anti-ice, and propeller de-ice — ON.
4. Check flight instruments for proper settings.
5. Notify all personnel in cabin of approach to the storm, and instruct to fasten safety belts.
6. Turn off any radio equipment rendered useless by static.
7. Retract trailing antenna.
8. At night, turn flight compartment lights full bright to minimize blinding effect of lightning.

**CAUTION**

Do not lower landing gear and wing flaps as they merely decrease the aerodynamic efficiency of the airplane.

**Note**

If desired, engage the autopilot with the altitude control switch OFF. Monitor closely.

**IN THE STORM**

1. Maintain power setting and pitch attitude (established before entering the storm) throughout the storm. Hold these constant and the airspeed will remain approximately constant regardless of the airspeed indicator. Concentrate principally on holding a level attitude by reference to the attitude indicator.
2. Maintain original heading. Do not make any turns unless necessary.
3. Do not "chase" the airspeed indicator, since doing so will result in extreme airplane attitudes. If a sudden gust should be encountered while the airplane is in a nose-high attitude, a stall might easily result. A heavy rain, by partly blocking the pitot tube pressure heads, may decrease the indicated airspeed reading considerably.
4. Use as little elevator control as possible in order to minimize the stresses imposed on the airplane.

5. The altimeter may be unreliable in thunderstorms because of differential barometric pressure within the storm. A gain or loss of several thousand feet may be expected. Make allowance for this error in determining minimum safe altitude.

**Note**

Altitudes between 10,000 and 20,000 feet AGL are usually the most turbulent areas in a thunderstorm. Therefore, altitudes below 10,000 feet are recommended for thunderstorm penetration. If possible, select an altitude of 6000 feet above the ground.

## NIGHT FLYING

Night flying presents no unusual problems. Before takeoff, make certain that all lights function properly. With flight compartment white lights off and red lights on, instruments will be easily visible, maximum visibility will be afforded outside the airplane and changeover to flying on instruments can readily be accomplished. The procedure for night landing is the same as that for normal daylight landing except for the use of landing lights.

## COLD WEATHER PROCEDURES

### COLD WEATHER CONDITIONS

**Note**

The following discussions apply when temperatures of +2°C (35°F) or below are encountered. Refer to ICE AND RAIN, this Section, for discussion of icing conditions.

**CAUTION**

During cold weather operation at temperatures below +2°C (35°F), do not operate nacelle flaps until preheat has been applied or engine is operating and oil temperature reaches 40°C. This will preclude damage to the operating mechanisms.

Many of the difficulties encountered during operation in extreme cold weather result from lack of understanding of the proper steps to be taken prior to and immediately after flight. It is important, therefore, that the flight crew be fully aware not only of the necessary procedures and precautions to be observed during flight, but also of the preflight and post-flight operational procedures relative to cold weather operation. Proper engine shutdown, using oil dilution, is especially important. It should never be necessary to drain oil when the proper dilution procedure has been accomplished. The use of oil

dilution after flight and of ground heating equipment before flight should allow engine starts to be made at any outside air temperatures encountered. Preheat, if available, is always the best procedure for cold weather starting.

### EXTERIOR INSPECTIONS

1. Check for removal of ice, snow and frost from wing and tail surfaces. Check that the leading edges of the control surfaces are clean. If hot air has been used, make certain that the areas are dry and ice-free.
2. Check that the leading edge seals of the elevators and rudder are flexible. No attempt should be made to move the surface controls until the seals are sufficiently pliable to preclude the possibility of cracking them.

**CAUTION**

- Hot water should not be used to remove frost or ice unless the airplane is sheltered in a warm hangar, as additional ice may form and aggravate the difficulty.
  - Before moving the airplane from a hangar to freezing temperature outside, sponge off critical areas where water may have accumulated.
3. Do not direct the removal of engine protective shield, nacelle covers, or propeller blade covers until just before starting engines. Make every effort to keep ground heater air in contact with the engine and accessories until ready for engine starting.
  4. Check engine preheating. Preheat is required if temperatures are below -18°C (0°F) even though oil dilution was accomplished at shutdown. Preheat may be required at temperatures below 2°C (35°F) if oil dilution was not accomplished at previous shutdown. Preheat should not be considered adequate until fluid oil will flow from the main oil tank sump drains, and the propellers can be rotated with the starter.

**CAUTION**

In extreme cold, congealed oil behind the piston rings prevents them from compressing to conform with any taper that may exist in the cylinder bore. Pistons "frozen" in this manner may be damaged when the engine is started. If the propellers hesitate or cannot be rotated easily by the starter, the engine has not been sufficiently preheated.

5. Check landing gear struts, actuating cylinders, locking mechanism, wheels, and brakes for freedom from ice, snow, slush, mud, frost, etc. Check landing gear limit switches for freedom from ice.
6. Determine that all exposed, vital operating surfaces on the landing gear (strut, pistons, etc.) are coated with a film of hydraulic fluid.
7. See that tires are not frozen to the ground or to the wheel chocks. Direct that ground heaters first be used to thaw frozen tires. In cases of extreme emergency, tires may be freed by overinflating to 1.5 times the normal tire pressure.

**CAUTION**

- To avoid excessive strain on tires, do not apply heat to overinflated tires.
  - Make certain that tire pressure is reduced to normal limits after using overinflation to free tires.
  - Do not attempt to move the airplane until tires are free.
8. Check pitot drain lines for freedom from ice. The drain plugs are located in the top forward section of the nose wheel well.
  9. Determine battery fluid level and specific gravity.

**Note**

If the fluid level is low, remove the batteries and install fully-serviced, fully-charged, warm batteries. If fluid is added to a battery just before starting engines, the battery will not produce maximum power.

10. Check oil tank sump drains for freedom of flow. Drain enough oil to make certain that oil is flowing from the tank and not merely from the drain line. If oil does not flow, or if flow is sluggish, direct that additional heat be applied locally to the tank, sump, and oil lines.
11. Check fuel drains for freedom from ice, mud, etc.
12. See that all fuel, water, and oil tank vent lines and engine crankcase breathers are free of frozen condensate.
13. Check engine stiffness periodically to determine when sufficient ground heater air has been applied. If the propeller cannot be rotated with the starter, the engine is not warm enough to start. In this case, continue to preheat the engine.

**Note**

With a ground heater delivering from 75,000 to 90,000 BTU per hour, at least 45 minutes will be required at a temperature of  $-34.4^{\circ}$  to  $-40^{\circ}\text{C}$  ( $-30^{\circ}$  to  $-40^{\circ}\text{F}$ ) to preheat the engine.

14. If it is determined that sufficient heat has been applied and the propeller still cannot be moved, a hydraulic lock probably exists. Have spark plugs removed from the bottom cylinders, let cylinders drain, pull propeller through with the starter, reinstall plugs, and attempt to start again.
15. Direct that flight compartment enclosure and pitot mast covers be removed.

**BEFORE STARTING ENGINES**

1. Determine that heat has been applied generally to the cabin and the flight compartment and locally to the radio equipment rack, electrical equipment rack, radar equipment rack, and to flight and engine instrument panels.
2. Check rear service door, escape hatches, and flight compartment windows to make certain that they will open. Then close and secure.

**Note**

It is customary in extreme cold weather to leave a small opening in the cabin and/or the flight compartment after the last engine shutdown to permit circulation of air inside the airplane as a frost preventive measure.

3. Place reserve oil heat switch to HEAT position. Check heater indicator lights. The initial heater light and the maintenance heater light should come on.
4. Check operation of the windshield heat and propeller heat, and on **A** and some **B** airplanes, check operation of pilot's and copilot's side windshield defrosting blowers.

**CAUTION**

To avoid overheating the deice heating elements when engines are not running, do not operate the propeller deice system for more than one complete cycle in a 30 minute period.

5. See that the parking brake handle is in the OFF position. If the handle is found to have been left ON, the brakes may be frozen. Notify the ground crew and, if necessary, direct that heat be applied to the brake discs and cylinders.
6. Direct that engine protective shields, nacelle covers, and propeller blade covers be removed. This should be the last operation before starting engines.

**STARTING ENGINES**

Except as noted in the following paragraphs, make cold weather starts using the procedures described in Section II for normal starts.

**Note**

If a battery start must be made, reduce electrical load to a minimum and turn off the inverter. After engine has been started, turn inverter switch to MAIN.

1. Under extreme cold conditions, it may be necessary to place the mixture control lever momentarily in the AUTO RICH position during engine cranking to obtain a sufficient amount of vaporized fuel to support combustion.
2. Do not crank continuously for a period longer than one minute (30 seconds if using battery power). If the engine does not start, allow the starter to cool for a least one minute. After the second and succeeding cranking cycles, allow five minutes for cooling.
3. Prime only after propeller starts to rotate. If primed prematurely, the gasoline will not vaporize. In extreme cold, operate the prime switch intermittently until regularity of firing results. It may then be necessary to continue priming for a short time after starting to maintain smooth engine operation.

**CAUTION**

Do not overprime. Scuffed cylinders, engine failures, and fires may result from overpriming.

4. Try to catch the engine on the first starting attempt. Ice may form on the spark plug points within a few seconds if the engine fires and quits. If the engine has not started after two or three attempts, it will save time by having several spark plugs removed and examined for ice. If icing has occurred, the front plugs should be removed and heated to dry the points before making another starting attempt.

**CAUTION**

If oil pressure does not indicate a positive rise within 30 seconds after engine start, shut down engine and investigate.

**Note**

- Indicated oil pressure may lag actual oil pressure by as much as 30 seconds dependent on the temperature and the amount of

restriction used on the oil transmitter. Indicated oil pressure response will be slower as the temperature of the oil is decreased, but actual oil pressure response will be nearly as rapid as on a standard day if oil dilution was properly accomplished.

- The oil pressure may be abnormally high immediately after starting. This is allowable; but as the oil temperature increases, the oil pressure should drop rapidly to normal. Do not increase engine speed until oil temperature and pressure are within limits.
5. Move carburetor heat control levers to HOT as soon as engine is firing regularly to improve operation. Return to COLD when engine operation is satisfactory.

**ENGINE GROUND OPERATION**

1. In extremely cold weather, oil congealing in the oil cooler may produce misleading indications. When this happens, the first indications are extremely high oil temperature and a reduction in oil pressure. Then, as the congealed oil is forced into the system, there is a sudden drop in temperature accompanied by an extreme rise in pressure. It is advisable to check oil temperature and pressure carefully in cold weather, allowing sufficient time for a thorough engine warmup. As the oil temperature increases, the pressure will rapidly drop to normal.
2. In cold weather, engine operation immediately after starting is frequently rough, with backfiring and after-firing due to poor vaporization of fuel, low cylinder head temperatures, and frosted spark plug points. Use of carburetor heat as soon as the engine is firing regularly will improve fuel vaporization and combustion.
3. When warming up an engine in which the oil has been properly diluted, the normal warm-up procedure will usually evaporate sufficient gasoline from the oil to preclude any difficulty with oil scavenging. A full power check should be made prior to take-off. Oil spewing during this check is an indication of over-dilution or poor scavenging. Properly diluted cold oil has the same viscosity and lubricating properties as hot undiluted oil. If it is necessary to boil off all of the fuel in the oil supply, operate the engine at normal operating temperatures for 45 to 60 minutes. High oil temperatures (above 70°C) will shorten this time slightly.
4. After several days layover, during which an engine has been started and the oil diluted several times, it is advisable to make a

ground run for at least 30 minutes, at normal temperatures, before takeoff. Also check the oil level; it will fall due to evaporation of gasoline. This ground run will correct any excess dilution which might otherwise cause oil discharge through the breathers or oil pressure drop during high-power takeoff.

5. When making a manifold pressure-rpm relationship check in cold weather, it may be noticed that the rpm will not quite come up to the check rpm. This is normal and is due to the increased air density at extreme low temperatures and the consequent increased air load on the propellers.
6. Throttles should be kept at a preliminary setting of 800 to 1000 rpm, depending upon the effectiveness of oil dilution at the time of previous engine shutdown. If oil pressure is steady and within limits, the preliminary warmup period may be shortened and the throttles advanced gradually to normal warm-up rpm. Use carburetor heat control levers in HOT position as necessary to assist vaporization and prevent backfiring. This will be especially important at temperature of  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) and below. After engine is well warmed, engine operation will be satisfactory with carburetor heat control lever in COLD.

#### Note

After levers are placed in COLD, approximately two minutes are required for temperatures to stabilize.

7. If oil pressure registers and then drops below normal after a few minutes of operation, shut down engine and check for failed pressure gage, blown oil lines or oil cooler, congealed oil, engine front and rear oil strainer drain plugs for foreign matter, ice, etc.
8. If oil temperature fluctuates or drops off with increase in rpm, reduce rpm and continue warmup at a lower rpm until oil temperature responds to increased engine speeds.
9. Exercise propellers several times to circulate warm oil through the propeller governing system.

#### WING FLAP CHECK

Direct ground crew to observe wing flaps carefully and with the hydraulic pressure bypass handle in the DOWN position, operate the wing flaps switch intermittently to move the flaps through one complete cycle (fully up, then to  $39^{\circ}$  down, and return to fully up). As flaps operate, check with ground crew and observe the wing flap position indicator to make certain that the flaps reach their extreme positions without hindrance from undetected snow or ice.

Stop flaps at various positions to determine whether the control and position indicator are in working condition.

#### PROPELLER MANUAL FEATHERING CHECK

If the rpm drop is very slow or sluggish, repeat the check until satisfactory operation is obtained. Otherwise, overspeeding may occur on takeoff. If propeller does not feather after three or four attempts, shutdown the engine and apply ground heater air to the engine, propeller dome, and feathering lines. Check the system for malfunctioning.

#### TAXIING

Before starting to taxi, direct ground crew to check that the tires are not frozen to the ground. If precipitation is encountered prior to takeoff or if icing conditions are anticipated, turn heat anti-ice, pitot heat, and propeller de-icing switches ON, and activate windshield anti-icing systems.

#### Note

On the ground, airflow into the augmentor muffs is not sufficient to provide wing and tail anti-icing.

#### CAUTION

- Painted areas on runways, taxiways, and ramps are significantly more slippery than non-painted areas. When painted areas are wet, the condition may deteriorate to the extent that the coefficient of friction is negligible. In addition, painted areas sometimes serve as condensation surfaces and it is possible to have wet, frosty, or even icy conditions on these areas when the overall weather condition is dry.
- When conditions of snow or ice exist, the approach ends of the runway are usually more slippery than other areas because of the melting and refreezing of the ice and snow at this point.

Use asymmetrical power applications for taxi steering on icy runways. Avoid using brakes. Make certain that the nose wheel is in line with the takeoff path before applying power for takeoff.

#### BEFORE TAKEOFF

If icing conditions prevail, or are anticipated, place the heat anti-icing button in the PUSH ON position and hold the nacelle flap switches to CLOSE. Leave augmentor vanes in TRAIL for takeoff. The cabin heat will not rise to the desired range while wing and tail anti-icing is in operation, but placing the cabin heat switch in AUTO at this time will assure obtaining the greatest possible benefit from the heat developed in the ventilating air by effect of the air compressor. It will also obviate the need of positioning the cabin heat switches after the wing and tail anti-icing system is turned off.

**TAKEOFF****WARNING**

Failure to remove snow and ice accumulated on the airplane while on the ground can result in serious aerodynamic and structural effects when the flight is attempted. Takeoff distances and climbout performance can be adversely affected, depending upon the weight and distribution of the snow and ice accumulated. The roughness, pattern, and location of the snow and ice could affect stall speeds and handling characteristics to a dangerous degree. In flight, structural damage may also result due to vibrations induced by unbalanced loads of unremoved accumulations. To eliminate these hazards, ice and snow must be removed from the airplane before flight is attempted.

1. If oil dilution was used on the previous engine shutdown, a takeoff can be made safely as soon as oil pressure is normal, engine operation is smooth, and the oil temperature is 40°C. Do not take off with over-diluted oil.
2. Carburetor heat may be used during takeoffs when atmospheric conditions are conducive to carburetor icing. The heat will aid fuel vaporization and improve carburetor performance. Remember that carburetor air temperature will increase rapidly. If temperatures go beyond the safe range, there will be a loss of manifold pressure and power with resulting detonation. Therefore, special precaution should be taken to maintain carburetor air temperature above the critical icing range while staying below the maximum allowable temperature limits for low blower. Watch the carburetor air temperature gage and be ready to reduce or shut off carburetor heat if temperatures go too high.

**CAUTION**

If carburetor heat is used for takeoff, the CAT that will be maintained must have been utilized in determining the performance data. The higher CAT's seriously reduce engine torque values, which in turn affect maximum allowable takeoff weight, desired flaps, critical field length, takeoff ground run, refusal speed, and landing data.

3. During cross-wind takeoff run on an icy runway, use asymmetrical power for directional control until rudder control becomes effective.

**WARNING**

The use of asymmetrical power for directional control will appreciably increase the required takeoff distance.

**AFTER TAKEOFF—CLIMB**

After taking off from a snow-covered or slush-covered runway and after reaching an altitude of approximately 500 feet above the terrain, operate the landing gear and wing flaps through several complete cycles to prevent their freezing in the retracted position. Turn propeller de-ice switch ON if icing prevails or is expected. During climb, the heat available for wing and cabin heat can become marginal if the nacelle flaps are left open. Close the nacelle flaps as far as possible consistent with maximum cylinder head temperature limitations. This will provide maximum heating. Increased airspeed in the climb lessens the probability of ice accumulation on the under surfaces of the wings and tail by decreasing the angle of attack. The greater cooling airflow thus generated by the increase in airspeed will also allow a lesser nacelle flap opening for engine cooling. Subsequently, augmentor vanes may be closed to a greater degree, resulting in more heat available to heat the wings and cabin. Increasing cylinder head temperatures to 220-232°C will ensure maximum effectiveness for anti-icing operation. Anti-icing systems should be turned on at least 30 minutes prior to entering an area where ice is expected.

**Note**

Whether in climb, cruise, or descent configuration, anticipating ice is the best insurance for prevention of structural icing. Keep duct temperatures as near maximum as possible. Use the augmentor vanes up to the maximum closure while maintaining engine limitations established in Section V.

**CRUISE**

1. Keep the nacelle flaps closed except as necessary to maintain wing anti-icing and cylinder head temperatures. If the cabin is being heated or if the wing and tail anti-icing system is being operated, the nacelle flaps may be closed in order to direct a strong flow of warm air into the cabin heat exchanger or the wing and tail anti-icing ducts. Use the carburetor heat control levers as required to prevent carburetor icing and to assist in maintaining normal engine operation.
2. If flight in icing conditions is necessary, increase power as required to maintain as close to a "zero" angle of attack as possible.

**Note**

- Refer to CARBURETORS, Section VII, for additional information on carburetor icing.
  - At low power settings, low cylinder head and carburetor air temperatures will result in inefficient fuel vaporization and distribution which will in turn cause rough engine operation. Sufficient carburetor heat should be applied to obtain smooth operation. Placing mixture control levers in AUTO RICH may also correct rough engine operation, but proper use of carburetor heat is preferable to operation in AUTO RICH because decreased fuel consumption is thus obtained.
3. Change propeller speed momentarily about 200 to 300 rpm every half hour to check operation of propeller governor.
  4. Close the augmentor vanes during anti-icing operation and control cylinder head temperatures by means of nacelle flap switches. Do not exceed MID-POSITION.
  5. Monitor the oil pressure and temperature gages frequently during flight in extremely low temperatures. Observation of a rise in oil temperature (which may exceed the limits) and a simultaneous drop in oil pressure is an indication of oil congealing in the oil cooler. At the first indication of oil congealing, place the oil cooler control switch in CLOSE position until temperature and pressure return to the normal operating range. Manually control the oil cooler doors to prevent recurrence of oil congealing.

**DESCENT**

Temperature inversions may occur when the weather is extremely cold, and the ground air may be 15° to 30°C (27° to 54°F) colder than the upper air. If this is the case, avoid rapid cooling during descent, even when using somewhat high engine power. Lower the landing gear and use part flaps to reduce airspeed while descending. Keep considerable power on the engines, and regulate nacelle flaps to prevent overcooling the engines. If possible, maintain cylinder head temperatures above 150°C and oil temperatures above 40°C during all letdowns. Closing the augmentor vanes will help in keeping up cylinder head temperatures. If the augmentor vanes are closed during descent, they must be opened before landing, in order to avoid overheating during ground operation. Use carburetor heat as necessary to maintain desired carburetor air temperature.

**Note**

- Part throttle operation during descent in cold weather and moisture conditions can result in formation of carburetor ice. If prolonged part throttle operation is required in icing air, especially in instru-

ment weather, maintain carburetor air temperatures as desired for the blower setting in effect.

- Carburetor heat will also assist in preventing spark plug fouling.
- Maintain at least 2000 rpm. Place mixture control levers in AUTO RICH only if necessary for cooling after accomplishing above items. Keep airplane in the anti-icing configuration.

**BEFORE LANDING**

Maintain a power setting sufficient to prevent overcooling of the engines. Use carburetor heat as necessary. If you anticipate encountering water-covered or slush-covered runways, turn the windshield anti-ice switches to START approximately 30 minutes before landing. Turn switches ON for full heat, if required, five minutes before landing. Use of reverse thrust may throw slush or water ahead of the airplane.

**WARNING**

If airplane has a visible accumulation of ice, approach speed should be 1.4 stall speed (minimum) and touchdown speed should be 1.3 stall speed (minimum).

**LANDING****WARNING**

Use minimum braking when landing on an icy runway. Brakes will be ineffective during initial landing roll.

Use rudder for directional control until propeller reverse pitch change is accomplished. Then, when landing on an icy runway, use asymmetrical power for steering control. If the landing is made on a water-covered or slush-covered runway, turn the windshield wipers on before using reverse thrust. After the landing roll, move the heat anti-icing button to PULL OFF. Turn the propeller de-ice switch and pitot heat switch OFF. Make the turnoff from the runway slowly to prevent skidding. Turn windshield anti-ice switches OFF and windshield wiper knob OFF as soon as they are not needed.

**ENGINE SHUTDOWN****Oil Dilution Procedures**

1. Before stopping engines in cold weather, oil in the engine oil tanks and the circulating system must be diluted with fuel to keep the oil from congealing before the next engine start.

# OIL DILUTION TABLE

ANTICIPATED TEMPERATURE		DILUTION REQUIRED PERCENT	OIL QUANTITY IN TANK AT START OF DILUTION GALLONS	TIME TO DILUTE	
C°	F°			MIN	SEC
-1	+30	5	19.5	1	0
-7	+20	7	19	1	20
-12	+10	10	18	2	0
-18	0	14	17	3	0
-29	-20	20	14	4	0
BELOW -29	BELOW -20	30	10	6	30

C-45312

Figure 9-4

CAUTION

Oil dilution shall not be attempted when oil temperature is above 50°C since the heat of the oil will evaporate the fuel. Whenever a long dilution period is required, and the oil temperature exceeds 50°C during the course of the dilution, the engines should be stopped temporarily to allow the oil temperature to drop. Dilution then should be continued to complete the required dilution time.

2. To dilute the oil, operate engines at 800 to 1200 rpm, turn fuel boost pump switch ON, hold oil dilute switch ON, and shut down the engine at the end of the dilution time indicated in figure 9-4.
3. Prior to stopping the engine, and while keeping the dilute switch ON, advance the throttle to 1500 to 1600 rpm and move propeller speed lever to DEC RPM (low lights). Repeat this three or four times to dilute the oil in the propeller. Partially feather the propeller several times before stopping the engine. Do not allow a propeller to completely feather or the engine may load-up and stall. Release

the dilute switch only after the engine stops turning.

**Note**

In extreme cold weather, undiluted oil in the propeller pitch-changing and feathering system can render these systems inoperative by becoming too viscous to circulate. For this reason, during the latter part of the dilution procedure the propeller speed levers and feathering buttons are used to cause diluted oil to circulate in the pitch-changing and feathering systems.

4. If it is necessary to service the oil tank, divide the oil dilution period so that dilution is accomplished both before and after servicing. The total dilution time shall be as specified in figure 9-4.
5. Check that oil dilution entry has been made on Form 781.

CAUTION

To prevent engine damage, do not shut down the engine as long as cylinder head temperature exceeds 200°C.

**BEFORE LEAVING THE AIRPLANE**

1. After wheels are chocked, release parking brake to avoid freezing the brakes in set position.
2. To prevent frosting up of the windows (which will occur in cold weather where air is not permitted to circulate) leave an emergency escape hatch open or one of the flight compartment windows open if this is possible without allowing snow or sleet to drift in. For layovers of four hours or more at temperatures below  $-29^{\circ}\text{C}$  ( $-20^{\circ}\text{F}$ ), remove the battery and store in a warm place.
3. Empty the drinking water tank to prevent damage by freezing.

**HOT WEATHER PROCEDURES****EXTERIOR INSPECTION**

Check the fabric seals at the rudder and elevator leading edges for freedom from fungi. If fungi are present, direct that fabric be cleaned with a soft cloth. Remove weather covers and pitot mast covers.

**BEFORE STARTING ENGINES**

Operate all movable surfaces. If necessary, warm electrical instruments with an external source of heat until all moisture is eliminated.

**STARTING ENGINES**

At extremely high ground temperatures, vapor lock may occur in the carburetor. If the engines will not start and run normally, they may be kept firing by using the primer until the vapor lock is dissipated.

**ENGINE GROUND OPERATION**

Make all possible ground checks before starting engines. Do not operate engines on the ground any longer than is absolutely necessary, as it is difficult to keep temperatures within limits during extended ground operation.

**BEFORE LEAVING THE AIRPLANE**

As soon as the engines have cooled, install weather covers. These covers will help to keep out moisture and inhibit corrosion and the growth of fungi.

**DESERT PROCEDURES**

If possible, conduct all engine ground operations on landing mats or on a hard surface free of sand, dust, and dirt. Where possible, head the airplane into the wind to provide maximum cooling conditions when engines are running. Cylinder head temperatures will rise rapidly during engine ground operation in extreme heat. Check the position of your airplane in relation to other parked aircraft. If necessary, reposition your airplane by tractor, or request that airplanes near you be moved to avoid their being sand-blasted during your engine ground run. Also, give the same consideration to personnel and ground installations. With the pilots' side windshields open and all other openings closed, maximum circulation

through the cabin will be provided. On **A**, **B**, and **C** airplanes operating the astrodome defrosting blowers will assist air circulation.

**EXTERIOR INSPECTION**

1. Check that all exterior surfaces of the airplane are free of sand and dirt.
2. If sand is blowing, do not direct removal of covers from engine nacelles, propeller blades, pitot tubes, and nose section until just before starting engines.
3. Check that main and nose gear wheel covers have been removed. Check that sand and dirt have been removed from landing gear struts, actuating cylinders, landing gear locking mechanism, wheels, and brakes. If shock struts and exposed portions of landing gear actuating cylinders are not clean, direct that they be wiped clean with a cloth moistened with hydraulic fluid, then wiped dry to prevent sand from sticking to the clean surfaces.
4. Check tires for blisters and obvious signs of deterioration from extreme heat.
5. Check all drains and vents for freedom from foreign matter and sand.

**BEFORE STARTING ENGINES**

1. Check escape hatches and flight compartment windows to make certain they will open, then close and secure.
2. Wipe instrument panels and dial faces free of dust and sand.
3. Direct that all remaining covers be removed (from engines, nacelles, propeller blades, pitot tubes, etc.).

**ENGINE GROUND OPERATION**

Keep duration of warmup and ground tests to a minimum. In extreme heat, observe cylinder head and carburetor air temperatures closely to avoid exceeding limits.

**CAUTION**

To avoid exceeding engine operating limitations, do not take off immediately after engine runup if cylinder head temperatures exceed  $170^{\circ}\text{C}$ . Idle engines at 800 to 1000 rpm until lowest cylinder head temperatures attainable are reached before starting the takeoff roll.

**BEFORE TAKEOFF**

Unless absolutely necessary, do not take off during sand or dust storms. Head the airplane cross-wind and stop engines. Do not take off in the wake of another airplane. Wait until blowing sand and dust are at a minimum.

**TAKEOFF—CLIMB**

Refer to the Appendix for air density correction. Keep careful check on cylinder head and carburetor air temperatures. Do not climb at speeds less than those given in the Appendix.

**CRUISE**

Keep the cabin heat selector switch in AUTO position and the cabin heat rheostat turned to DECREASE for maximum cool air ventilation.

**DESCENT**

The airplane will have a greater rate of descent in extreme heat than in moderate temperatures due to the decreased lift effect of hot air.

**ENGINE SHUTDOWN**

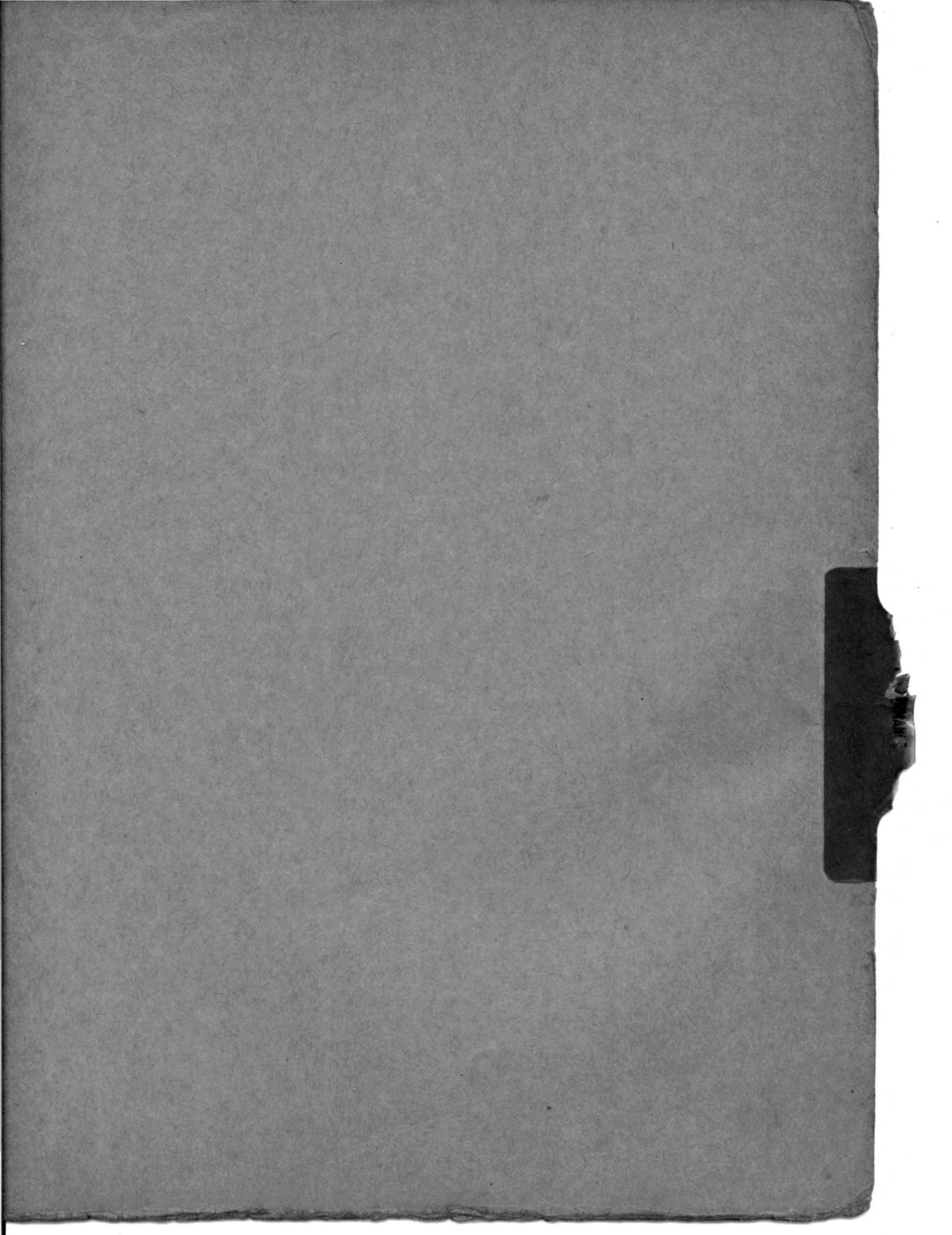
Park the airplane headed into the wind and in a position to prevent sandblasting other aircraft in the vicinity. Stop the engines as soon as possible to avoid excessive cylinder head temperature rise. Expedite postflight engine checks to avoid raising clouds of dust and sand.

**BEFORE LEAVING THE AIRPLANE**

As soon as the engines have cooled, install weather covers. Take extreme care to prevent sand or dust from entering the fuel and oil tanks during servicing. Leave pilots' compartment windows open slightly to assure air circulation.

**CAUTION**

- If sand or dust storms are anticipated, do not leave windows or doors open unless a crew member is available to secure the airplane when necessary. All openings, windows, and doors must be closed during sand storms. Sand is a greater evil than heat, and every precaution must be taken to keep it out of the nacelles and cabin interior.
- If wind storm is in progress or anticipated, order that the airplane be tied down. Check that this has been accomplished before leaving the airplane.



# OPERATIONAL SUPPLEMENT

## FLIGHT MANUAL

### USAF SERIES

# T-29A, B, C, AND D

## AIRCRAFT

24 JUL 1974

THIS PUBLICATION SUPPLEMENTS T.O. 1T-29A-1, DATED 5 DECEMBER 1967.

**COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED AIR FORCE PERSONNEL.**

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3 JULY 1974

### NOTICE TO PILOTS

- Write the number of this supplement alongside the changed portion of the Flight Manual.

#### 1. PURPOSE.

Multi-purpose - (a) Provide information that will require a pause when switching inverters, (b) provide information on rear service door, (c) correct an error, (d) provide information on power settings when use of alternate grade fuel is necessary, and (e) clarify manifold pressure limits.

#### 2. GENERAL.

(a) A pause in the OFF position while switching inverters should alleviate the problem of damaged inverters from sticking contacts and high voltage feed back.

(b) In a recent emergency ground evacuation, a crew member found that the rear service door had to be pushed out after pulling jettison handle.

(c) The incorrect fuel flow was a clerical error.

(d) With shortages of 115/145 grade fuel becoming more frequent and the use of 100/130 grade fuel increasing, some commands have requested guidance in the use of the Maximum Power Available charts when fuel grade changes occur.

(e) Determination of overboost cannot be made from the Manifold Pressure Limits chart which provides only an RPM, manifold pressure, and torque relationship.

### 3. INSTRUCTIONS.

#### SECTION II, NORMAL PROCEDURES.

Page 2-6, BEFORE STARTING ENGINES.

Item \*10. Inverters - Checked & Main (FE).

Add a CAUTION before the two Notes:



When moving inverter selector switch from MAIN to SPARE or from SPARE to MAIN, pause approximately 5 seconds in the OFF position. This pause will permit control relay contacts to fully open, preventing damage to the inverters from high voltage feed back.

#### SECTION III, EMERGENCY PROCEDURES

Page 3-32, Inverter Failure (A)(B)(C).

Add a CAUTION before the two Notes:



When moving inverter selector switch from MAIN to SPARE or from SPARE to MAIN, pause approximately 5 seconds in the OFF position. This pause will permit control relay contacts to fully open, preventing damage to the inverters from high voltage feed back.

Page 3-16, Figure 3-5.

Under the words "PROCEDURE FOR JETTISONING REAR SERVICE DOOR" add the following Note:

## NOTE

After pulling hinge pin release, it may be necessary to push door out.

Also add above Note on pages 3-17, 8-15, and 8-16.

PERFORMANCE DATA, APPENDIX I

PART 2 - ENGINE DATA (A) (B)

Page 1A2-28, Fig. 1A2-28.

Correct an error. Change the 2700 RPM DESIRED FUEL FLOW from "210" to "1210."

PERFORMANCE DATA, APPENDIX II

PART 2 - ENGINE DATA (C) (D)

Page 2A2-3, MAXIMUM POWER AVAILABLE

Add the following Note just above the MANIFOLD PRESSURE LIMITS paragraph:

## NOTE

When an airplane has been serviced with 100/130 grade fuel, the 100/130 Maximum Power Available charts must be used until the following conditions are accomplished.

- a. After one full load of 115/145 grade fuel has been incrementally added to tank(s), takeoff settings from the 115/145 Maximum Wet Power Available chart may be utilized.
- b. After two full loads of 115/145 grade fuel have been incrementally added, takeoff settings from the 115/145 Maximum Dry Power Available chart and high blower METO power (115/145 limits) may be utilized.
- c. The two full loads rule must be utilized if the water injection system is inoperative.

Page 2A2-3, MANIFOLD PRESSURE LIMITS.

Add the following Note:

NOTE

Exceeding manifold pressure limits presented in Fig. 2A2-6 does not necessarily constitute an overboost. Refer to Section V, EXCESSIVE MANIFOLD PRESSURE (OVERBOOSTING) for definition of overboost.

THE END

## FLIGHT MANUAL, SAFETY SUPPLEMENT, AND OPERATIONAL SUPPLEMENT STATUS

A status page is published with each Safety Supplement, Operational Supplement, Flight Manual Change, and Flight Manual Revision. It provides a comprehensive listing of the current Flight Manual, Flight Crew Checklists, Safety Supplements, and Operational Supplements. If you are missing one listed on this page, see your Publications Distribution Officer and get your copy.

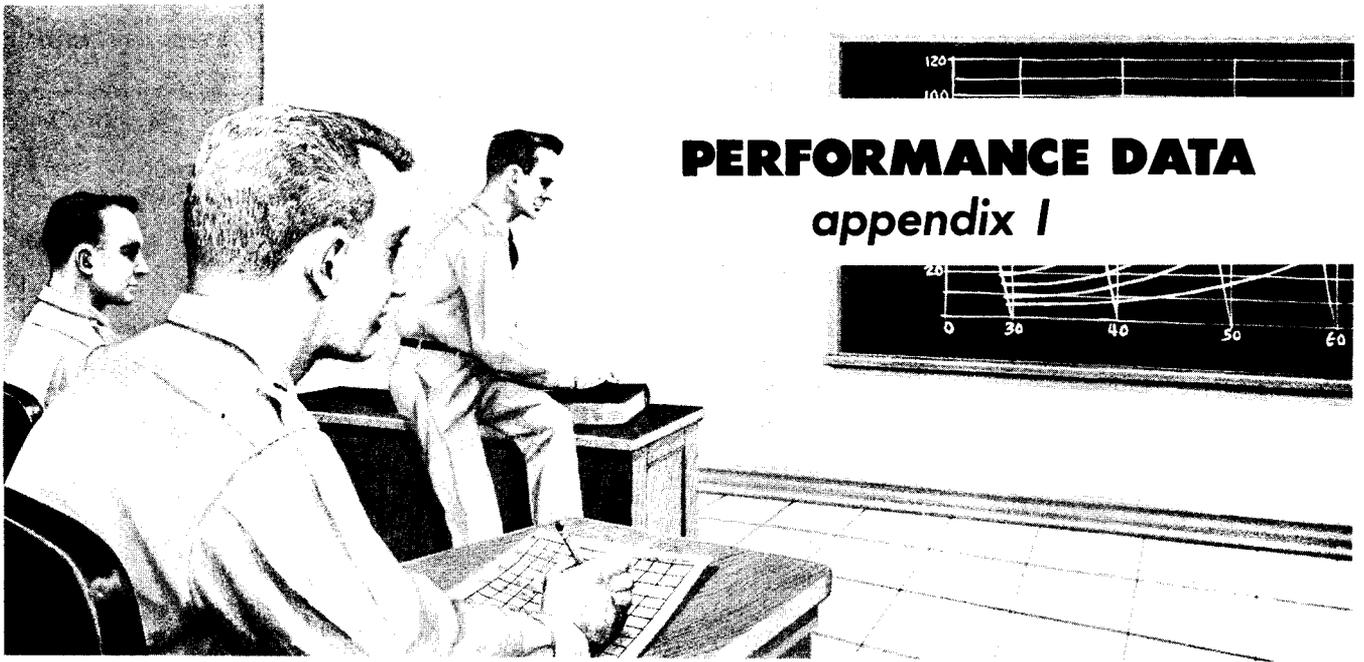
CURRENT FLIGHT MANUAL	DATE	CHANGE
T.O. 1T-29A-1	5 Dec 67	#3 - 8 Feb 74
CURRENT FLIGHT CREW CHECKLIST	DATE	CHANGE
T.O. 1T-29A-1CL-1 (Pilots')	5 Dec 67	#3 - 8 Feb 74
T.O. 1T-29A-1CL-2 (Navigator's)	5 Dec 67	#2 - 8 Feb 74
T.O. 1T-29A-1CL-3 (Flight Steward's)	15 Jan 65	#2 - 8 Feb 74
T.O. 1T-29A-1CL-1-1 (Pilots' Scroll)	8 Feb 74	- - - - -

## CURRENT SAFETY AND OPERATIONAL SUPPLEMENTS

NUMBER	DATE	SHORT TITLE	FLIGHT MANUAL PAGES AFFECTED
S-40	3 Jul 74	100/130 Fuel	2-6, 3-32, 1A2-28, 2A2-3

## REPLACED/RESCINDED SUPPLEMENTS

NUMBER	DATE	DISPOSITION
None		



**PERFORMANCE DATA**  
*appendix I*

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**PART 1 – INTRODUCTION****A B****TABLE OF CONTENTS**

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The symbol \* indicates an illustration

**SCOPE AND ARRANGEMENT**

The charts contained in this Appendix present the performance of the **A** and **B** airplanes in a graphical form. They are based on ICAO standard atmospheric conditions; however, nomograms are provided to allow corrections for non-standard conditions as necessary. The charts are arranged in a logical sequence in seven basic divisions for planning general phases of each flight.

## PART 1 – INTRODUCTION

## PART 2 – ENGINE DATA

## PART 3 – TAKEOFF

## PART 4 – CLIMB

## PART 5 – CRUISE

## PART 6 – APPROACH AND LANDING

## PART 7 – MISSION PLANNING

Descriptive text in each part discusses and explains the use of the charts provided. A sample problem at the end of the Appendix shows how the individual performance charts for each phase of a flight can be combined for flight planning purposes.

**GLOSSARY OF TERMS AND ABBREVIATIONS**

**ABSOLUTE CEILING**—Maximum altitude at which level flight can be maintained with zero feet per minute rate of climb.

**ACCELERATION CHECK SPEED, TIME/DISTANCE**—A means of checking airplane acceleration during takeoff roll using time or distance.

The acceleration time check provides the most accurate check of acceleration. With this method, an even 10 knot increment not less than 5 and not more than 15 knots below refusal speed will normally be used as an acceleration check speed. As a secondary procedure, on marked runways the acceleration check may be made at a distance marker. For this method, the acceleration check point will normally be the first 1000 foot marker at least 500 feet but no more than 1500 feet prior to the refusal distance.

**AIRSPEED**

**IAS**—Indicated airspeed; observed airspeed corrected for instrument error.

**CAS**—Calibrated airspeed; IAS corrected for installation error in the pitot system.

**EAS**—Equivalent airspeed; CAS corrected for compressibility error. For all practical purposes at altitudes below 15,000 feet, the compressibility factor is negligible for this airplane.

**TAS**—True airspeed; EAS corrected for relative density.

$$TAS = EAS \times \frac{1}{\sqrt{\sigma}}$$

**BEST CLIMB SPEED**—The airspeed which results in the best angle of climb (climb gradient). Except

when minimum control speed is involved, the best climb speed for obstacle clearance is 1.2 stall speed for the gross weight and wing flap setting.

BHP—Brake horsepower.

CAT—Carburetor air temperature.

CRITICAL ALTITUDE—The altitude at which full throttle is required to maintain a given BHP at a set RPM.

CRITICAL ENGINE FAILURE SPEED ( $V_{crit}$ )—The speed at which failure of one engine permits acceleration to takeoff in the same distance that the airplane may be decelerated to a stop using brakes only.

CRITICAL FIELD LENGTH—The total length of runway required to accelerate on all engines to the critical engine failure speed, lose one engine, and then continue takeoff, or stop.

CRUISE CEILING—Maximum altitude at which a rate of climb of 300 feet per minute can be maintained with METO power.

DENSITY ALTITUDE—Pressure altitude corrected for temperature. When conditions are standard, pressure altitude and density altitude are the same. Consequently, if the temperature is above standard, the density altitude will be higher than the pressure altitude. If the temperature is below standard, the density altitude will be lower than the pressure altitude.

DEWPOINT—The temperature at which, under ordinary conditions, condensation begins in a cooling mass of air. This temperature is used as the basis for calculating the effect produced by humidity on the power output of the engines.

EXPECTED TORQUE PRESSURE—The torque pressure which the engine may be expected to develop when the effects of altitude and atmospheric conditions are considered.

LANDING GROUND ROLL—Distance from touchdown to complete stop, utilizing brakes only, on a dry hard surface with propellers windmilling.

MAP—Engine absolute manifold pressure (in. Hg).

MAXIMUM DRY POWER—The maximum power permissible from the engine when the water injection system is not used; limited to five minutes.

MAXIMUM WET POWER—The maximum power permissible from the engine utilizing the water injection system; limited to five minutes.

METO (MAXIMUM EXCEPT TAKEOFF) POWER—The maximum power at which the engine can be operated continuously without damage.

MILITARY POWER—The same as maximum dry power except that the time limit is 30 minutes. An airplane engine can actually be run continuously under overload conditions of power and speed for much longer periods than those permitted by the ratings. However, the period of reliable operation is thereby reduced to an impractically short time. By imposing a time limit on maximum and military power ratings, the cumulative effect of the overloads is distributed evenly over the period between overhauls and the useful life of the engine accordingly lengthened. When use of military power is absolutely required for longer than 30 minutes, a notation must be made on Form 781.

MINIMUM CONTROL SPEED ( $V_{mc}$ )—Speed required to provide sufficient control to enable the airplane to fly a straight flight path over the ground with takeoff configuration, one engine windmilling, maximum power on other engine and no more than 5° bank angle away from the failed engine.

MINIMUM PERFORMANCE TORQUE PRESSURE—95% of expected torque pressure.

MINIMUM SAFE SINGLE-ENGINE SPEED—Speed that will permit the airplane to maintain a minimum 100 fpm rate of climb in clean configuration (sea level, standard atmosphere) with the propeller on the inoperative engine feathered and maximum power on the operating engine.

OAT (FAT)—Outside or free air temperature; denoted as runway air temperature when observed at the runway.

PRESSURE ALTITUDE—The height or vertical distance from the standard datum plane. This is a theoretical plane where air pressure is equal to 29.92 in. Hg at 15°C (59°F).

REFUSAL SPEED ( $V_R$ )—The maximum speed to which the airplane can be accelerated and still be stopped on the remaining runway using brakes only.

RUNWAY HEADWIND COMPONENT—Resultant headwind parallel to runway, as a result of wind direction and velocity.

SIGMA ( $\sigma$ ) = Density ratio ( $\rho/\rho_0$ ). The ratio between ambient density and standard sea level density.  $\frac{1}{\sqrt{\sigma}}$  is the correction factor for air density applied to EAS to obtain TAS. Sigma is commonly known as "smoe."

SERVICE CEILING—Maximum altitude at which a rate of climb of 100 feet per minute can be maintained.

STALL SPEED ( $V_S$ ) — Speed at which the airplane starts to drop because of separation of airflow over the wings due to insufficient airspeed or excessive angle of attack.

STANDARD ATMOSPHERE—An arbitrary variation of air density, pressure, and temperature with

altitude used for comparing engine and airplane performance. Standard air at sea level is represented by a barometric pressure of 29.92 in. Hg at 59°F (15°C) and zero humidity.

**TAKEOFF DISTANCE**—Distance from start of takeoff to takeoff speed with both engines operating.

**TAKEOFF SPEED**—Speed at which main wheels leave the ground. ( $1.2 V_s$ ).

**TORQUE PRESSURE (TPSI)**—An indication of power being delivered to the propeller shaft by the engine.

**WIND ACCOUNTABILITY**—The wind correction nomograms on the charts are calculated on the basis of 100% wind accountability.

## DISCUSSION OF STANDARD CHARTS

The standard charts (figures 1A1-1 through 1A1-7) are provided for ready reference in determining standard and non-standard atmospheric conditions, and in determining compressibility and position error corrections to airspeed readings. For all normal flight planning compressibility effect on airspeed and altitude indication is negligible. Nevertheless, the airplane commander should study the standard charts and their limitations and be ready to apply them as necessary to satisfy any specific detail problem.

### DENSITY ALTITUDE CHART

Density altitude may be found from this chart (figure 1A1-1), for a given temperature and pressure altitude condition.

#### EXAMPLE

- Outside air temperature = 25°C.
- Pressure altitude = 3500 feet.
- $\frac{1}{\sqrt{\sigma}} = 1.083$ .
- Density altitude = 5400 feet.

This chart also provided a  $\frac{1}{\sqrt{\sigma}}$  value necessary to

change equivalent airspeed to true airspeed. Enter the chart with the given temperature condition, proceed vertically to the pressure altitude, and read

horizontally to the right to obtain the  $\frac{1}{\sqrt{\sigma}}$  value.

True airspeed (TAS) may then be obtained from equivalent airspeed (EAS) by multiplying the given

EAS by the  $\frac{1}{\sqrt{\sigma}}$  value.

### DENSITY ALTITUDE VERSUS $\frac{1}{\sqrt{\sigma}}$

This chart (figure 1A1-2) gives values of  $\frac{1}{\sqrt{\sigma}}$  accurately for every 100-foot increment in density altitude.

### STANDARD ALTITUDE TABLE

A Standard Altitude Table (figure 1A1-3) shows standard atmospheric values as defined by ICAO. The standard atmosphere defined by ICAO represents an approximation to the average atmosphere of the world. The ICAO assumes a temperature of 15°C (59°F) and a pressure of 29.92 in. Hg for sea level conditions. The temperature variation with height is approximately uniform from 15°C (59°F) at sea level to -56.5°C (-69.7°F) at 36,089 feet. This altitude is assumed to be the beginning of the isothermal region or stratosphere. For all practical purposes the temperature will remain constant as altitude is increased above 36,089 feet. The corresponding pressures and densities are shown on the Standard Altitude Table. ICAO standard atmosphere values have been used in preparation of all performance charts in this Appendix. Data for non-standard conditions are shown as variations from the ICAO standard atmosphere.

### PRESSURE ALTITUDE TABLE

The Pressure Altitude Table (figure 1A1-4) provides the necessary corrections to field elevation to obtain pressure altitude from the altimeter setting. To determine pressure altitude, find the altitude correction ( $\Delta$  ALT) for the given altimeter setting. Add this correction algebraically to the field elevation to obtain pressure altitude.

### TEMPERATURE CONVERSION CHART

The Temperature Conversion Chart (figure 1A1-5) is presented in degrees centigrade versus degrees Fahrenheit to facilitate the conversion of given temperatures as desired.

### AIRSPED CALIBRATION

Airspeed Calibration (figure 1A1-6) for the airspeed system shows indicated airspeed versus calibrated airspeed to account for the location of the static pressure pickup. The effects of airplane attitude are negligible to the position error in terms of wing flap setting, landing gear position, and gross weight.

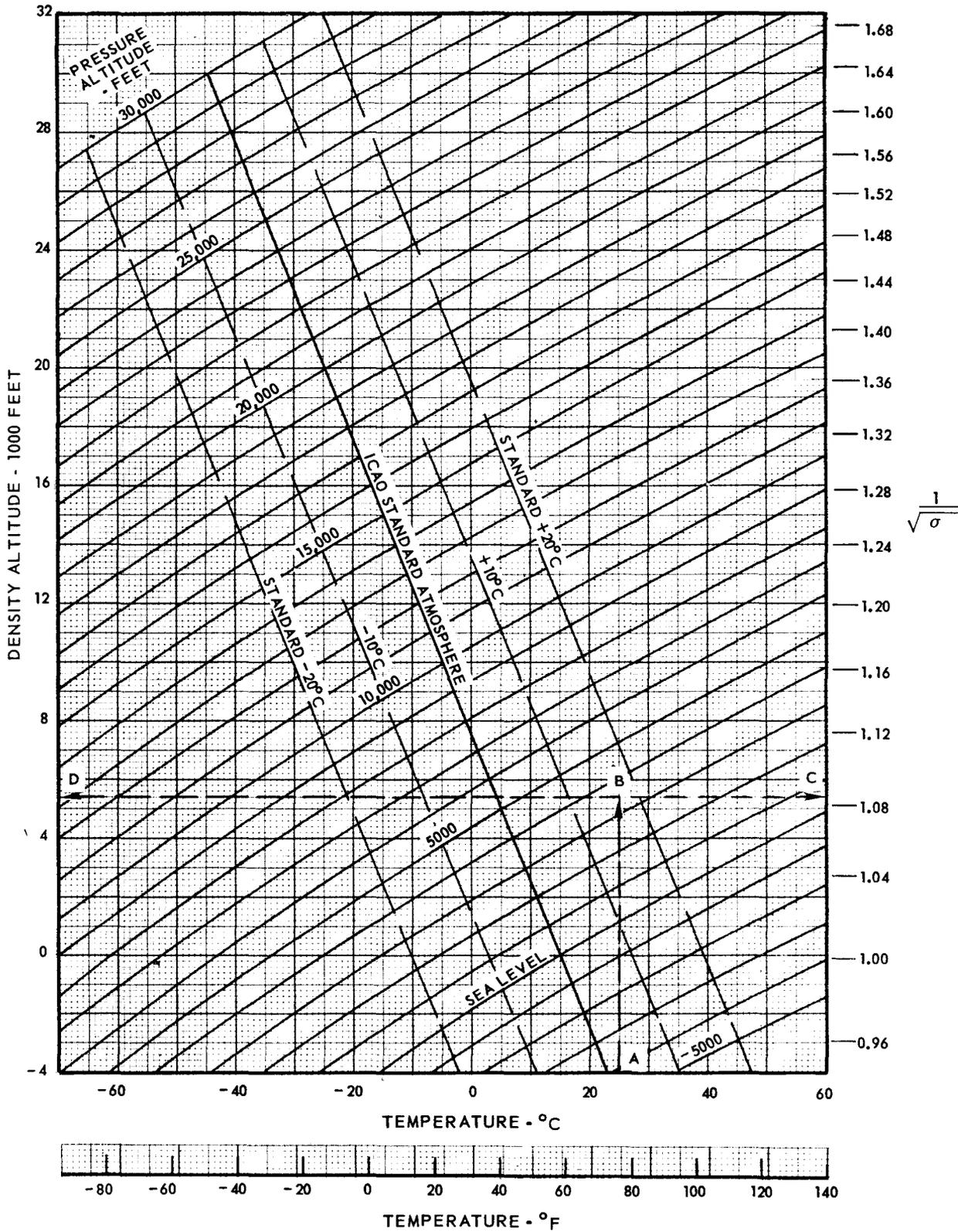
### AIRSPED COMPRESSIBILITY CORRECTION CHART

This chart (figure 1A1-7) presents calibrated airspeed versus equivalent airspeed to account for the compressibility of the atmosphere.

### ALTIMETER POSITION ERROR CORRECTION

Altimeter errors due to static port location are negligible and no correction is necessary.

### DENSITY ALTITUDE CHART



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Figure 1A1-1

DENSITY ALTITUDE VS  $\frac{1}{\sqrt{\sigma}}$

TRUE AIRSPEED = EQUIVALENT AIRSPEED  $\times \frac{1}{\sqrt{\sigma}}$

DENSITY ALTITUDE (FEET)	$\frac{1}{\sqrt{\sigma}}$														
100	1.0014	3300	1.0501	6500	1.1023	9700	1.1582	12900	1.2186	16100	1.2837	19300	1.3541	22400	1.4277
200	1.0029	3400	1.0516	6600	1.1039	9800	1.1600	13000	1.2206	16200	1.2858	19400	1.3564	22500	1.4302
300	1.0044	3500	1.0531	6700	1.1056	9900	1.1618	13100	1.2225	16300	1.2879	19500	1.3587	22600	1.4327
400	1.0059	3600	1.0548	6800	1.1073	10000	1.1637	13200	1.2245	16400	1.2901	19600	1.3609	22700	1.4351
500	1.0074	3700	1.0563	6900	1.1090	10100	1.1655	13300	1.2265	16500	1.2922	19700	1.3632	22800	1.4376
600	1.0088	3800	1.0579	7000	1.1107	10200	1.1674	13400	1.2285	16600	1.2943	19800	1.3655	22900	1.4401
700	1.0103	3900	1.0595	7100	1.1124	10300	1.1692	13500	1.2305	16700	1.2965	19900	1.3678	23000	1.4426
800	1.0118	4000	1.0611	7200	1.1141	10400	1.1711	13600	1.2324	16800	1.2986	20000	1.3701	23100	1.4451
900	1.0133	4100	1.0627	7300	1.1158	10500	1.1729	13700	1.2337	16900	1.3007	20100	1.3724	23200	1.4477
1000	1.0148	4200	1.0643	7400	1.1176	10600	1.1748	13800	1.2364	17000	1.3029	20200	1.3748	23300	1.4502
1100	1.0163	4300	1.0659	7500	1.1193	10700	1.1766	13900	1.2385	17100	1.3050	20300	1.3771	23400	1.4528
1200	1.0178	4400	1.0675	7600	1.1210	10800	1.1785	14000	1.2404	17200	1.3072	20400	1.3795	23500	1.4553
1300	1.0193	4500	1.0692	7700	1.1228	10900	1.1803	14100	1.2424	17300	1.3094	20500	1.3819	23600	1.4579
1400	1.0208	4600	1.0707	7800	1.1245	11000	1.1822	14200	1.2444	17400	1.3116	20600	1.3842	23700	1.4604
1500	1.0223	4700	1.0724	7900	1.1262	11100	1.1841	14300	1.2465	17500	1.3138	20700	1.3866	23800	1.4630
1600	1.0238	4800	1.0740	8000	1.1280	11200	1.1860	14400	1.2485	17600	1.3159	20800	1.3889	23900	1.4656
1700	1.0253	4900	1.0756	8100	1.1297	11300	1.1879	14500	1.2506	17700	1.3181	20900	1.3913	24000	1.4681
1800	1.0268	5000	1.0773	8200	1.1315	11400	1.1893	14600	1.2526	17800	1.3203	21000	1.3937	24100	1.4706
1900	1.0283	5100	1.0789	8300	1.1332	11500	1.1917	14700	1.2546	17900	1.3225	21100	1.3961	24200	1.4732
2000	1.0299	5200	1.0806	8400	1.1350	11600	1.1926	14800	1.2567	18000	1.3247	21200	1.3985	24300	1.4758
2100	1.0314	5300	1.0822	8500	1.1368	11700	1.1955	14900	1.2587	18100	1.3267	21300	1.4009	24400	1.4784
2200	1.0329	5400	1.0839	8600	1.1385	11800	1.1974	15000	1.2608	18200	1.3292	21400	1.4033	24500	1.4810
2300	1.0344	5500	1.0855	8700	1.1403	11900	1.1993	15100	1.2628	18300	1.3314	21500	1.4068	24600	1.4836
2400	1.0360	5600	1.0872	8800	1.1420	12000	1.2012	15200	1.2649	18400	1.3337	21600	1.4082	24700	1.4862
2500	1.0375	5700	1.0888	8900	1.1438	12100	1.2031	15300	1.2670	18500	1.3360	21700	1.4106	24800	1.4888
2600	1.0390	5800	1.0905	9000	1.1456	12200	1.2050	15400	1.2691	18600	1.3382	21800	1.4130	24900	1.4914
2700	1.0406	5900	1.0921	9100	1.1474	12300	1.2070	15500	1.2712	18700	1.3405	21900	1.4154	25000	1.4940
2800	1.0421	6000	1.0936	9200	1.1492	12400	1.2089	15600	1.2732	18800	1.3427	22000	1.4179		
2900	1.0436	6100	1.0954	9300	1.1510	12500	1.2109	15700	1.2753	18900	1.3450	22100	1.4203		
3000	1.0454	6200	1.0971	9400	1.1528	12600	1.2128	15800	1.2774	19000	1.3473	22200	1.4228		
3100	1.0469	6300	1.0988	9500	1.1546	12700	1.2147	15900	1.2795	19100	1.3493	22300	1.4253		
3200	1.0485	6400	1.1005	9600	1.1564	12800	1.2167	16000	1.2816	19200	1.3518				

Figure 1A1-2

### Standard Altitude Table

Standard Sea Level Air:

T = 15° C.

W = .07651 lb./cu. ft.

$\rho_0 = .002378$  slugs/cu. ft.

P = 29.921 in. of Hg.

1" of Hg. = 70.732 lb./sq. ft. = 0.4912 lb./sq. in.

This table is based on NACA Technical Report No. 218  $a_0$  - 1116 ft./sec.

Altitude feet	Density Ratio $\rho/\rho_0$	$\frac{1}{\sqrt{\sigma}}$	Temperature		Speed of Sound Ratio $a/a_0$	Pressure	
			Deg. C	Deg. F		In. of Hg.	Ratio P/P <sub>0</sub>
0	1.0000	1.0000	15.000	59.000	1.0000	29.92	1.0000
1000	.9710	1.0148	13.019	55.434	.997	28.86	.9644
2000	.9428	1.0299	11.038	51.868	.993	27.82	.9298
3000	.9151	1.0454	9.056	48.301	.990	26.81	.8962
4000	.8881	1.0611	7.075	44.735	.986	25.84	.8636
5000	.8616	1.0773	5.094	41.169	.983	24.89	.8320
6000	.8358	1.0938	3.113	37.603	.979	23.98	.8013
7000	.8106	1.1107	1.132	34.037	.976	23.09	.7716
8000	.7859	1.1280	-0.850	30.471	.972	22.22	.7427
9000	.7619	1.1456	-2.831	26.904	.968	21.38	.7147
10000	.7384	1.1637	-4.812	23.338	.965	20.58	.6876
11000	.7154	1.1822	-6.793	19.772	.962	19.79	.6614
12000	.6931	1.2012	-8.774	16.206	.958	19.03	.6359
13000	.6712	1.2206	-10.756	12.640	.954	18.29	.6112
14000	.6499	1.2404	-12.737	9.074	.950	17.57	.5873
15000	.6291	1.2608	-14.718	5.507	.947	16.88	.5642
16000	.6088	1.2816	-16.699	1.941	.943	16.21	.5418
17000	.5891	1.3029	-18.680	-1.625	.940	15.56	.5202
18000	.5698	1.3247	-20.662	-5.191	.936	14.94	.4992
19000	.5509	1.3473	-22.643	-8.757	.932	14.33	.4790
20000	.5327	1.3701	-24.624	-12.323	.929	13.75	.4594
21000	.5148	1.3937	-26.605	-15.890	.925	13.18	.4405
22000	.4974	1.4179	-28.586	-19.456	.922	12.63	.4222
23000	.4805	1.4426	-30.568	-23.022	.917	12.10	.4045
24000	.4640	1.4681	-32.549	-26.588	.914	11.59	.3874
25000	.4480	1.4940	-34.530	-30.154	.910	11.10	.3709
26000	.4323	1.5209	-36.511	-33.720	.906	10.62	.3550
27000	.4171	1.5484	-38.493	-37.287	.903	10.16	.3397
28000	.4023	1.5768	-40.474	-40.853	.899	9.720	.3248
29000	.3879	1.6056	-42.455	-44.419	.895	9.293	.3106
30000	.3740	1.6352	-44.436	-47.985	.891	8.880	.2968
31000	.3603	1.6659	-46.417	-51.551	.887	8.483	.2834
32000	.3472	1.6971	-48.399	-55.117	.883	8.101	.2707
33000	.3343	1.7295	-50.379	-58.684	.879	7.732	.2583
34000	.3218	1.7628	-52.361	-62.250	.875	7.377	.2465
35000	.3098	1.7966	-54.342	-65.816	.871	7.036	.2352
36000	.2962	1.8374	-55.000	-67.000	.870	6.708	.2242
37000	.2824	1.8818	-55.000	-67.000	.870	6.395	.2137
38000	.2692	1.9273	-55.000	-67.000	.870	6.096	.2037
39000	.2566	1.9738	-55.000	-67.000	.870	5.812	.1943
40000	.2447	2.0215	-55.000	-67.000	.870	5.541	.1852
41000	.2332	2.0707	-55.000	-67.000	.870	5.283	.1765
42000	.2224	2.1207	-55.000	-67.000	.870	5.036	.1683
43000	.2120	2.1719	-55.000	-67.000	.870	4.802	.1605
44000	.2021	2.2244	-55.000	-67.000	.870	4.578	.1530
45000	.1926	2.2785	-55.000	-67.000	.870	4.364	.1458
46000	.1837	2.3332	-55.000	-67.000	.870	4.160	.1391
47000	.1751	2.3893	-55.000	-67.000	.870	3.966	.1325
48000	.1669	2.4478	-55.000	-67.000	.870	3.781	.1264
49000	.1591	2.5071	-55.000	-67.000	.870	3.604	.1205
50000	.1517	2.5675	-55.000	-67.000	.870	3.436	.1149

25,750A

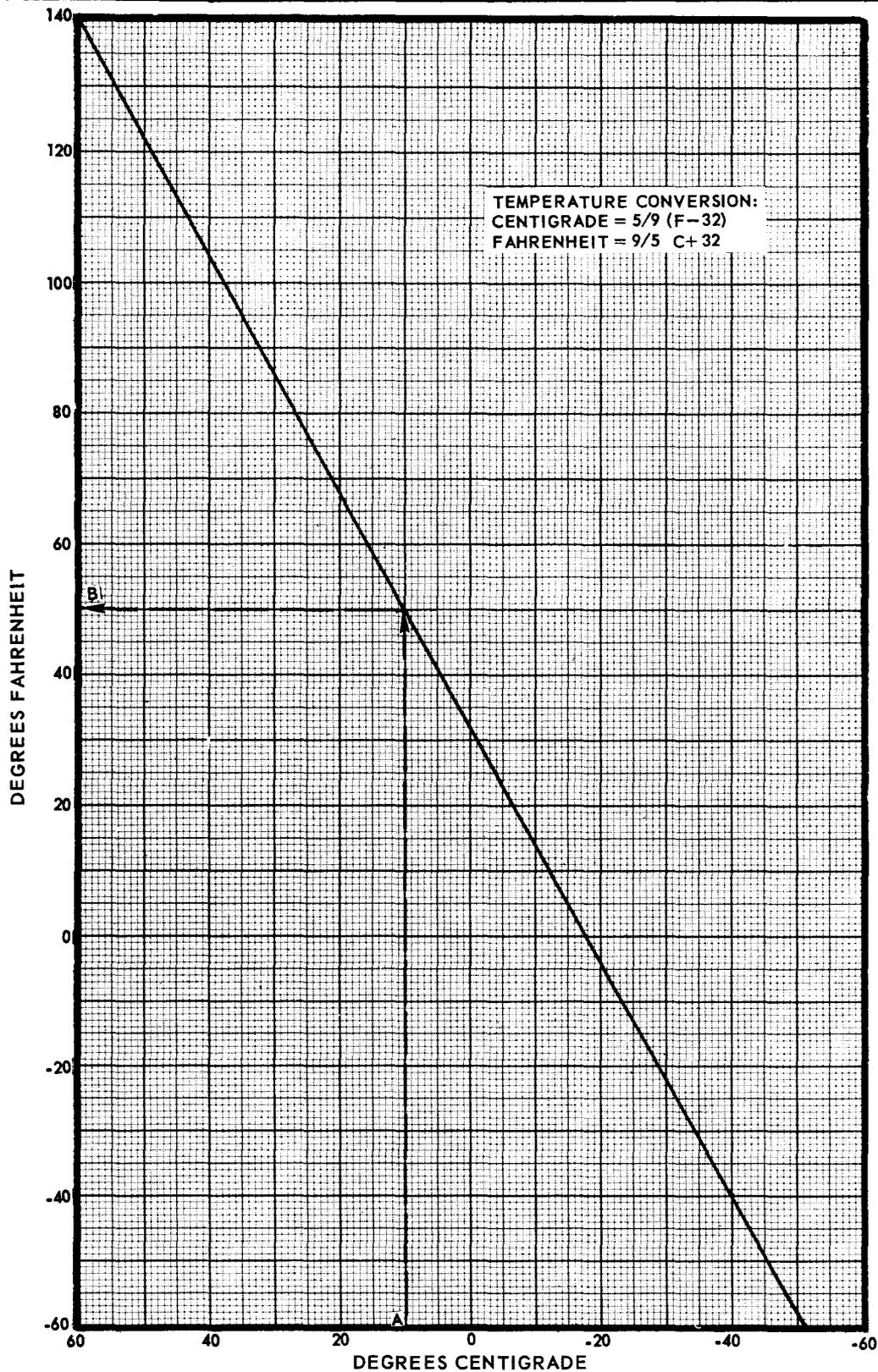
Figure 1A1-3

PRESSURE ALTITUDE TABLE													
PRESSURE ALTITUDE = FIELD ELEVATION + Δ ALTITUDE													
ALTI-METER SETTING IN. HG	Δ ALT FT	ALTI-METER SETTING IN. HG	Δ ALT FT	ALTI-METER SETTING IN. HG	Δ ALT FT	ALTI-METER SETTING IN. HG	Δ ALT FT	ALTI-METER SETTING IN. HG	Δ ALT FT	ALTI-METER SETTING IN. HG	Δ ALT FT	ALTI-METER SETTING IN. HG	Δ ALT FT
28.00	1824	28.50	1340	29.00	863	29.50	392	30.00	-73	30.50	-531	31.00	-983
.01	1814	.51	1330	.01	853	.51	382	.01	-82	.51	-540	.01	-992
.02	1805	.52	1321	.02	844	.52	373	.02	-91	.52	-549	.02	-1001
.03	1795	.53	1311	.03	834	.53	364	.03	-100	.53	-558	.03	-1010
.04	1785	.54	1302	.04	825	.54	354	.04	-110	.54	-567	.04	-1019
.05	1776	.55	1292	.05	815	.55	345	.05	-119	.55	-576	.05	-1028
.06	1766	.56	1282	.06	806	.56	336	.06	-128	.56	-585	.06	-1037
.07	1756	.57	1273	.07	796	.57	326	.07	-137	.57	-594	.07	-1046
.08	1746	.58	1263	.08	787	.58	318	.08	-146	.58	-604	.08	-1055
.09	1737	.59	1254	.09	777	.59	308	.09	-156	.59	-613	.09	-1064
28.10	1727	28.60	1244	29.10	768	29.60	298	30.10	-165	30.60	-622	32.00	-1073
.11	1717	.61	1234	.11	758	.61	289	.11	-174	.61	-631		
.12	1707	.62	1225	.12	749	.62	280	.12	-183	.62	-640		
.13	1698	.63	1215	.13	739	.63	270	.13	-192	.63	-649		
.14	1688	.64	1206	.14	730	.64	261	.14	-202	.64	-658		
.15	1678	.65	1196	.15	721	.65	252	.15	-211	.65	-667		
.16	1668	.66	1186	.16	711	.66	242	.16	-220	.66	-676		
.17	1659	.67	1177	.17	702	.67	233	.17	-229	.67	-685		
.18	1649	.68	1167	.18	692	.68	224	.18	-238	.68	-694		
.19	1639	.69	1158	.19	683	.69	215	.19	-248	.69	-703		
28.20	1630	28.70	1148	29.20	673	29.70	205	30.20	-257	30.70	-712		
.21	1620	.71	1139	.21	664	.71	196	.21	-266	.71	-721		
.22	1610	.72	1129	.22	655	.72	187	.22	-275	.72	-730		
.23	1601	.73	1120	.23	645	.73	177	.23	-284	.73	-740		
.24	1591	.74	1110	.24	636	.74	168	.24	-293	.74	-749		
.25	1581	.75	1100	.25	626	.75	159	.25	-303	.75	-758		
.26	1572	.76	1091	.26	617	.76	149	.26	-312	.76	-767		
.27	1562	.77	1081	.27	607	.77	140	.27	-321	.77	-776		
.28	1552	.78	1072	.28	598	.78	131	.28	-330	.78	-785		
.29	1542	.79	1062	.29	589	.79	122	.29	-339	.79	-794		
28.30	1533	28.80	1053	29.30	579	29.80	112	30.30	-348	30.80	-803		
.31	1523	.81	1043	.31	570	.81	103	.31	-358	.81	-812		
.32	1513	.82	1034	.32	560	.82	94	.32	-367	.82	-821		
.33	1504	.83	1024	.33	551	.83	85	.33	-376	.83	-830		
.34	1494	.84	1015	.34	542	.84	75	.34	-385	.84	-839		
.35	1484	.85	1005	.35	532	.85	66	.35	-394	.85	-848		
.36	1475	.86	995	.36	523	.86	57	.36	-403	.86	-857		
.37	1465	.87	986	.37	514	.87	47	.37	-412	.87	-866		
.38	1456	.88	976	.38	504	.88	38	.38	-421	.88	-875		
.39	1446	.89	967	.39	495	.89	29	.39	-431	.89	-884		
28.40	1436	28.90	957	29.40	485	29.90	20	30.40	-440	30.90	-893		
.41	1427	.91	948	.41	476	.91	10	.41	-449	.91	-902		
.42	1417	.92	938	.42	467	.92	1	.42	-458	.92	-911		
.43	1407	.93	929	.43	457	.93	-8	.43	-467	.93	-920		
.44	1398	.94	919	.44	448	.94	-17	.44	-476	.94	-929		
.45	1388	.95	910	.45	439	.95	-26	.45	-485	.95	-938		
.46	1378	.96	900	.46	429	.96	-36	.46	-494	.96	-947		
.47	1369	.97	891	.47	420	.97	-45	.47	-504	.97	-956		
.48	1359	.98	881	.48	410	.98	-54	.48	-513	.98	-965		
.49	1350	.99	872	.49	401	.99	-63	.49	-522	.99	-974		

46,257

Figure 1A1-4

### TEMPERATURE CONVERSION CHART



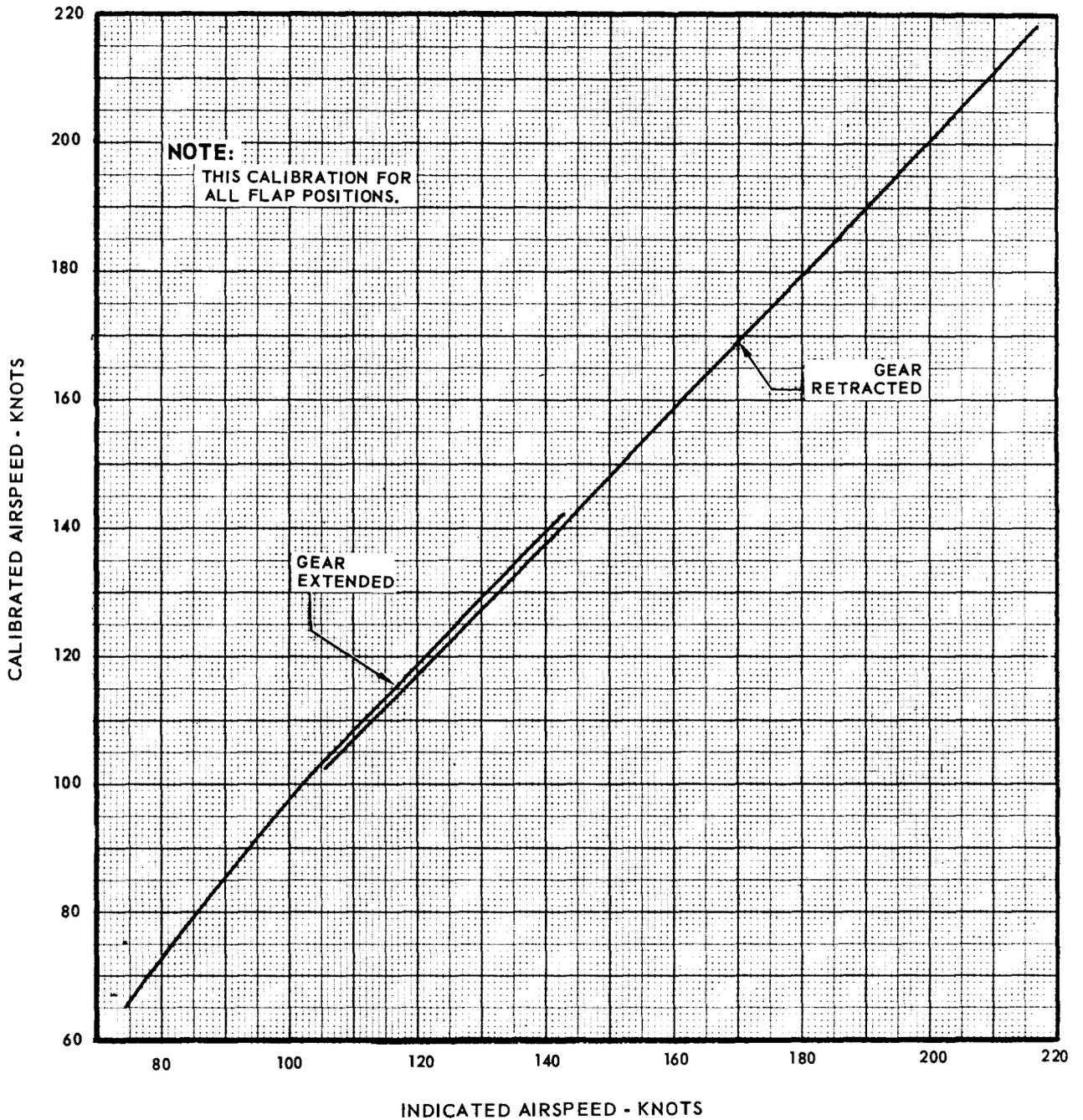
46,258A

Figure 1A1-5

MODEL: T-29A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

### AIRSPEED CALIBRATION

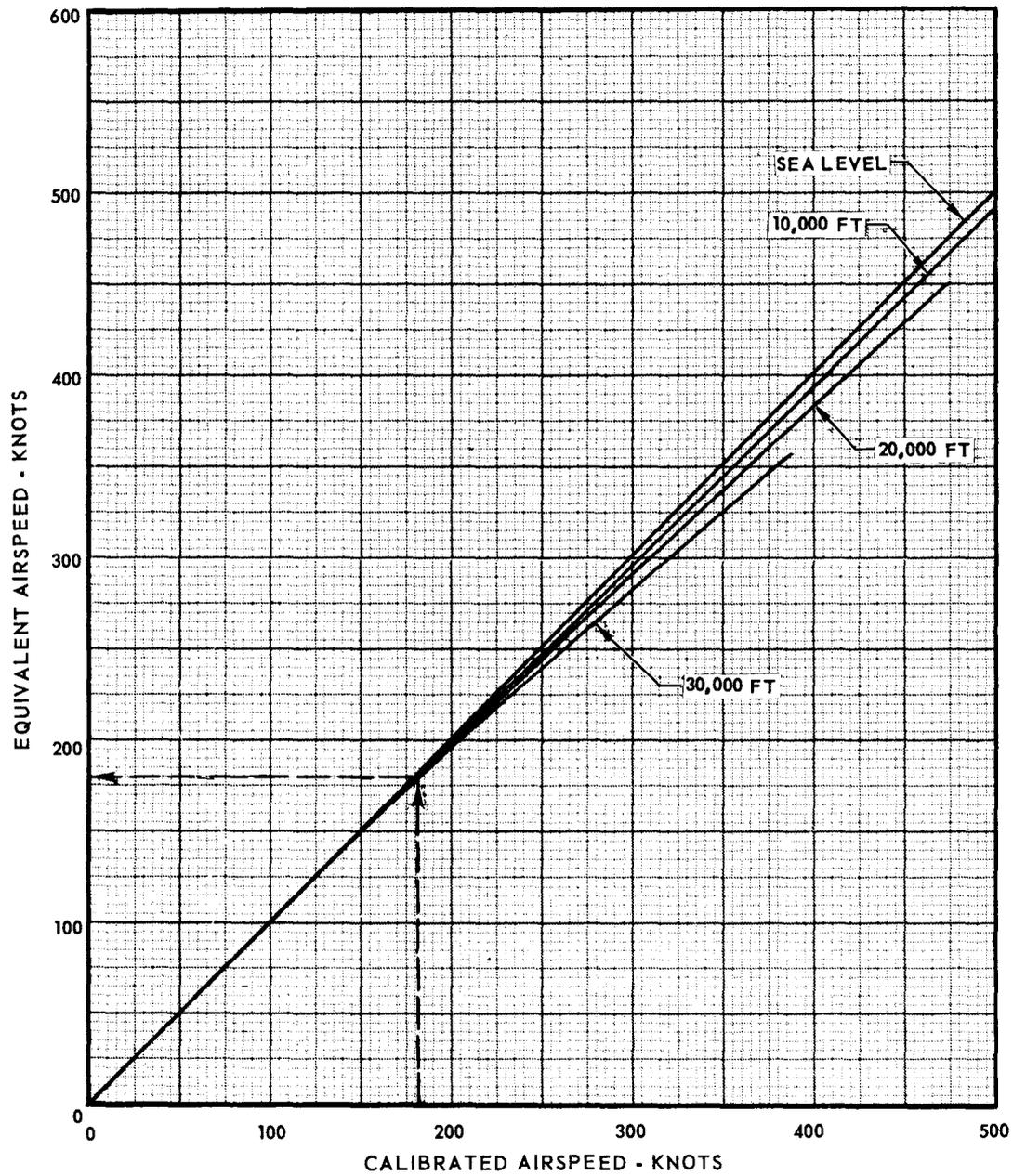
ENGINES: R2800-97



10,701A

Figure 1A1-6

### AIRSPEED COMPRESSIBILITY CORRECTION



45,502C

Figure 1A1-7

**PART 2 – ENGINE DATA**

**A B**

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The symbol \* indicates an illustration

**ENGINE DATA**

**ENGINE POWER TIME LIMITATIONS**

The engines are approved by the manufacturer for five minutes of operation at maximum wet power, five minutes at maximum dry power, and 30 minutes at MILITARY power. There is no time limit for operation at METO power or less. Maximum power is determined during the normal preflight planning by reference to the maximum power available curves.

**ENGINE RATINGS, LIMITS, AND THE CONTROL OF POWER**

The standard engine ratings are Maximum Wet, Maximum Dry, Military, and METO. Each is expressed in terms of power (bhp), engine speed (rpm) and pressure altitude (ft above sea level). The operating limits which apply to each rating include such variables as spark advance, mixture strength, manifold pressure, torque pressure, carburetor air temperature, cylinder head temperature, oil inlet temperature, oil pressure and fuel pressure. These limits must be observed individually and collectively to stay within the envelope of conditions which determines reliable engine performance, and

to avoid malfunction. For power settings below the engine ratings, such as those used for climb and cruise flight, the operating limits are conservative from the viewpoint of engine reliability and are set to achieve long engine life and economical maintenance. The control of power is established primarily by setting rpm and manifold pressure. Power available curves and power charts show the rpm and manifold pressure required for the full range of engine performance under specific operating conditions. The charts show a range of carburetor air temperature and the manifold pressure required to obtain a selected power corrected to the observed temperature conditions. This correction for non-standard conditions of carburetor air temperature amounts to an increase in manifold pressure of approximately 1.0 percent for each 5.5 °C that the temperature exceeds standard altitude temperature (15 °C at sea level). If the carburetor air temperature is colder than standard, a corresponding decrease in manifold pressure is shown for accurate power setting. The rules for application of this manifold pressure correction vary depending on the power level and on the operating condition. The maximum manifold pressure specified in Section V

for each of the engine ratings is regarded as a never-exceed limit under all operating conditions, except for the allowable manifold pressure increase to partially offset the loss of power due to humidity. These limits appear in Section V and on the power available charts. This means that no upward correction to manifold pressure is allowed at any of the standard engine ratings to compensate for power loss due to hotter than standard temperature conditions. However, an upward correction to manifold pressure to compensate for power loss due to high humidity is allowed, provided the increase is in accordance with the correction graphs on the power charts. For takeoff in colder than standard conditions (with carburetor air temperatures below 15°C) and particularly under extremely cold arctic conditions, it is desirable to avoid overpowering the engine beyond its ratings. Two alternate procedures for adjusting power at the engine ratings are suggested under cold weather conditions: (1) Reduce the takeoff manifold pressure (approximately 1.0 inch Hg for each 10°C below standard carburetor air temperature (15°C at sea level). (2) Observe both manifold pressure and torque pressure as a limit, adjusting the throttle to whichever limit occurs first. The torque pressure limit established should account for normal tolerances of accuracy to torque-meter instrumentation and should make allowance for engine accessory power requirements by subtracting this amount (four psi for right engine) from the maximum allowable torque pressure. At lower power levels, below the engine ratings, such as at climb and cruise power settings, manifold pressure has been corrected either up or down for variation of carburetor air temperature from standard altitude air temperature in accordance with the methods outlined above. Once the correct manifold pressure is established, it is usually regarded as a maximum operating limit to avoid the possibility of overboosting a malfunctioning engine. At these power settings, torque pressure can also be used as a limit in conjunction with manifold pressure.

#### RECOMMENDED CONTINUOUS CRUISE OPERATION

It is permissible to use up to METO power for continuous cruise operation; however, this procedure yields range values that are considerably less than maximum. A detailed study of the power charts and the endurance summary chart reveals that optimum cruise performance requires a gradual increase in cruise altitude as the flight progresses. The optimum cruise profile can be attained by using altitude and airspeed as the most important cruise parameters, while using the MAP, TPSI, rpm, and fuel flow indication only to monitor the engine operation. For best airplane performance at a given altitude, engine controls must be adjusted so that a gradual decrease in power is accomplished. If the predetermined BHP, as defined by the cruise charts, does not give the recommended cruise airspeed, then the MAP should be adjusted until the correct airspeed is obtained. Do not exceed engine operating limits in making this adjustment.

#### DISCUSSION OF CHARTS

##### MAXIMUM POWER AVAILABLE

The Maximum Power Available Charts (figures 1A2-1 and 1A2-2) include nomograms correcting

engine delivered power to non-standard conditions both with and without water-alcohol injection (wet or dry) for normal fuel grade 115/145 or alternate fuel grade 100/130. The charts show the maximum power available for given conditions of pressure altitude, CAT., and dew point temperature. An expected TPSI scale is included and a minimum performance TPSI scale which incorporates a 5% margin for operational use. Allowable torque pressure gage tolerances vary throughout the instrument range; therefore, static readings prior to engine start cannot be applied to computed minimum performance data. The only authorized adjustments to computed minimum torque are specified in the notes on the Maximum Power Available charts. The maximum power available charts are based upon operation at 2800 rpm and full throttle except where manifold pressure (MAP) is limited by the engine manufacturer's recommendations. In operation at higher elevations, use all available power but do not exceed limits.

#### CAUTION

For takeoff in colder than standard conditions (with carburetor air temperature below 15°C sea level) avoid overboosting the engines beyond their ratings. Observe torque pressure limits during takeoff and reduce manifold pressure approximately 0.5 in. Hg for each 5° below standard CAT (15°C sea level). A nomogram above the maximum power limit on each chart provides the necessary correction to expected manifold pressure for colder than standard conditions.

To partially offset the loss of power due to humidity, the expected MAP for takeoff powers as provided in the applicable power available chart may be increased due to the existing water vapor pressure up to a maximum of 1.5 inches Hg. This correction may only be made when the combination of pressure altitude and carburetor air temperature indicate that takeoff power may be developed with less than full throttle setting. The maximum power available curves are to be used to determine the minimum performance TPSI for computing takeoff performance. These computations are to be accomplished as a part of the preflight planning.

#### EXAMPLE

Given:  
CAT (OAT + 1°C) = 20°C  
Pressure altitude = 3500 feet.  
Dew Point = 55°F.  
Power condition = Wet, 2800 rpm, AUTO RICH.

#### Note

The values of OAT should be obtained whenever possible from the tower. Indicated OAT is less desirable because of radiation effects when the airplane is on the ground.

Select the proper power available curve (figure 1A2-1). Enter the chart at pressure altitude of 3500 feet (A) and read up to CAT of 20°C (B). Note manifold pressure 49 in. Hg at full throttle. Read across

to dew point base line and parallel guide line to 55°F, corrected for altitude (C). Read across to find expected TPSI 105.5 (D); and minimum performance TPSI 100 (E).

#### Note

- If the BHP obtained by the chart is greater than the limiting BHP because of CAT below standard conditions, proceed horizontally to the MAP correction nomogram (A). Parallel the guide lines to the limiting BHP and TPSI (B), then vertically to read MAP correction for low CAT (C).
- When operating at part throttle, a manifold pressure increase may be allowable due to humidity. Determine allowable manifold pressure increase on the separate graph. Proceed horizontally to the correction nomogram baseline (A), parallel the guide lines to the allowable correction (B), then proceed horizontally to BHP and torque pressure.

#### MANIFOLD PRESSURE LIMITS

A manifold pressure limits curve (figure 1A2-4) is presented to determine the limiting manifold pressure that can be used with any given rpm on a standard day. Curves for auto lean and auto rich operation in high or low blower at various rpm and pressure altitude values are provided. Engine operation above indicated MAP/rpm combinations may result in exceeding torque pressure limits on a standard day. This chart may be used to cross-check MAP settings when power settings are changed during climb or cruise.

#### CLIMB POWER SCHEDULES

Two climb power schedules (figures 1A2-5 and 1A2-8) are presented for use in establishing power for two-engine operational climb at 1400 BHP/ENG and METO power. The climb power tables are based on operation with AUTO RICH mixture.

#### Note

Operation in the 2500 to 2700 rpm range is restricted (at 30 in. Hg MAP and above) except to pass through this range. METO power is 2700 rpm in low blower and 2500 rpm in high blower.

### WARNING

High power (30 in. Hg MAP and above) engine operation at speeds between 2500

and 2700 rpm may cause propeller blade fatigue failure induced by resonant vibration stresses.

#### POWER SCHEDULES

Power schedules (figures 1A2-13 through 1A2-29) are presented in tabular form for a range of cruise powers from 900 BHP to 1700 BHP. Each schedule presents the manifold pressure, blower setting, and rpm necessary to maintain a constant BHP under various conditions of pressure altitude and carburetor air temperature. Tolerance to MAP setting is  $\pm 1.5$  inches Hg. In addition, the schedules provide the TPSI and fuel flow which should be obtained when the mixture is leaned at cruise power settings of 1200 BHP (low blower) and below. For cruise power settings at 1200 BHP in high blower and above, fuel flow figures represent the fuel flow with the mixture in AUTO RICH.

#### Note

In cases where appreciable power losses are encountered due to carburetors running too rich, the mixture may be manually adjusted to correct the power deficiency. If the mixture is manually adjusted to correct such a power deficiency, the resulting fuel flow must never be less than the applicable minimum fuel flow at the designated power setting.

The power schedules are based upon operating both engines at the same rpm and MAP. On  $\text{B}$  airplanes this procedure results in slightly different horsepower being delivered to each propeller, and a little less than maximum performance from the airplane, because of the unbalanced accessory loads in the engines. The right engine carries the additional load of the cabin compressor. These effects are small, however, and are not likely to cause a noticeable difference in control or performance. Since any particular combination of blower setting and rpm may be associated with many different manifold pressure values (depending on pressure altitude and carburetor air temperature), a broken line across the table separates the HIGH and LOW blower positions and light lines are used to separate the different rpm values. To use the schedules, enter the table at the pressure altitude and read the manifold pressure horizontally to the right under the appropriate carburetor air temperature. Then follow the rpm lines and read the blower position, rpm, TPSI, and fuel flow to the right in the same rpm channel.

**EFFECT OF RAM.** In flight, at a given indicated airspeed, an effective boost is given to the quantity of air received by the induction system. This increase is commonly referred to as ram. The effect

is the same as an increase to whatever supercharging is produced by the engine blower. The engine manufacturer's data used in preparing the power schedules do not include the effects of ram. The full throttle settings given in the tables will not be at the full throttle position under flight conditions due to the effect of ram. At a given altitude, rpm and full throttle position, the BHP developed will be increased in proportion to the amount of ram. Also if the BHP is held constant the effect of ram will increase the altitude at which this power can be developed at the full throttle position.

**FUEL FLOW PER ENGINE**

Fuel flow per engine charts (figures 1A2-30 and 1A2-31) are presented to determine fuel flow, corresponding to any selected brake horsepower.

Curves for auto-rich or auto-lean operation in high or low blower at various rpm values are provided.

**EXAMPLE**

Given:

BHP per engine = 800 bhp.

RPM = 1800.

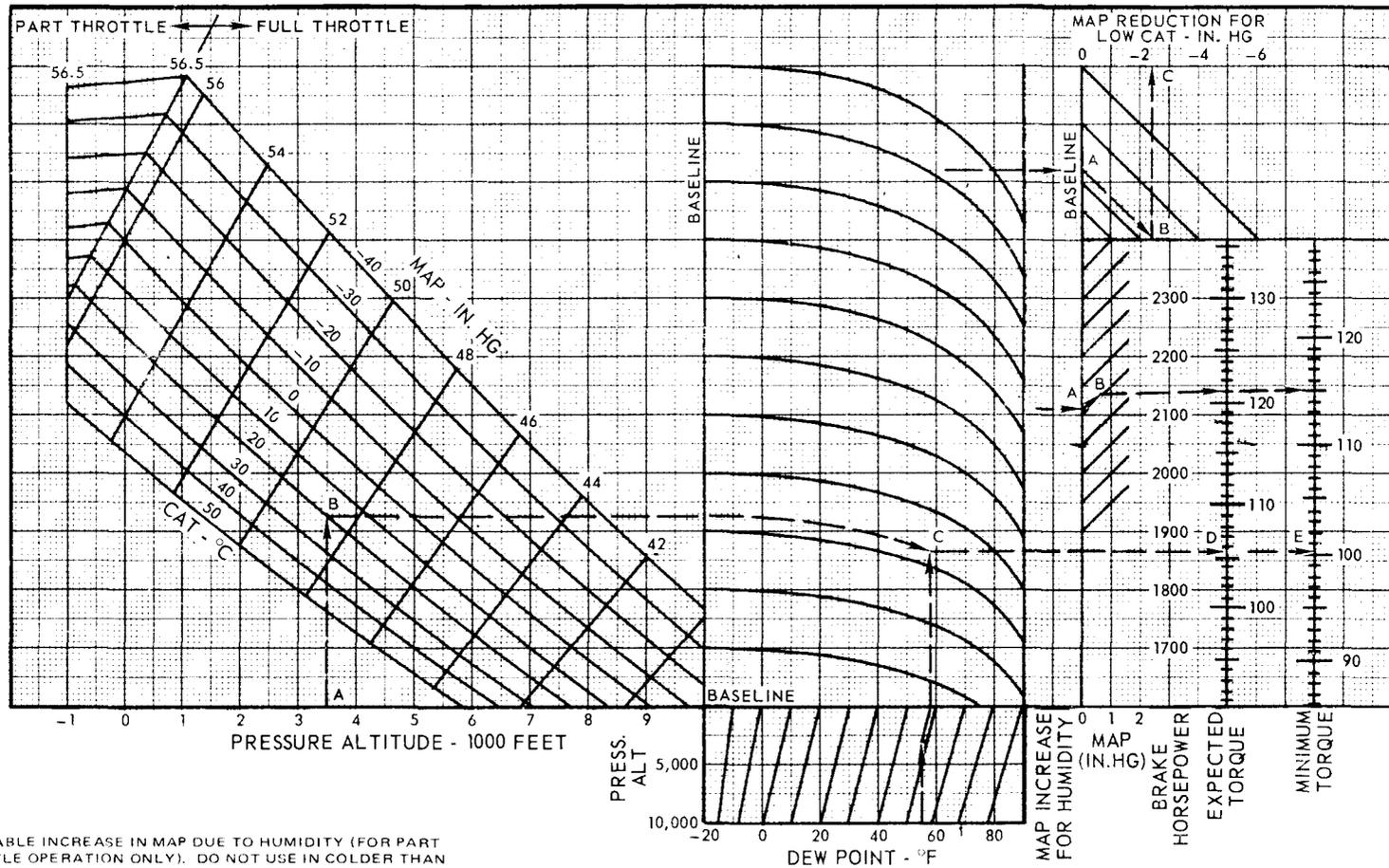
Blower = LOW.

Enter chart (figure 1A2-30) at 800 bhp (A) and read up to rpm 1800 (B). Read across to the left and read fuel flow 360 pph (C). Note that mixture is in AUTO LEAN.

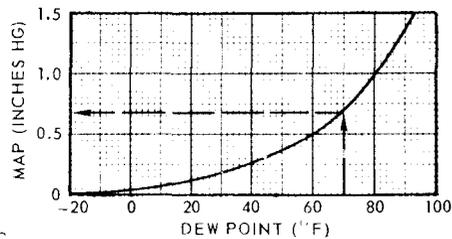
MODEL: T-29 A/B  
 DATE: 14 JULY 1961  
 DATA BASIS: FLIGHT TEST

MAXIMUM WET POWER AVAILABLE  
 FUEL GRADE 100/130 OR 115/145  
 LOW BLOWER 2800 RPM AUTO RICH

ENGINE: R2800-97



ALLOWABLE INCREASE IN MAP DUE TO HUMIDITY (FOR PART THROTTLE OPERATION ONLY). DO NOT USE IN COLDER THAN STANDARD CONDITIONS WHEN MAP IS REDUCED FOR LOW CAT.



NOTES:

- (1) CAT EQUALS OAT + 1°C.
- (2) WHEN OPERATING CABIN PRESSURIZATION (T-29B) TORQUE PRESSURE FOR RIGHT ENGINE WILL BE 4.3 PSI LOWER.
- (3) CHART BASED ON ZERO AIRSPEED. DO NOT EXCEED MAP LIMITS DURING TAKEOFF.
- (4) FUEL FLOW IS  $(0.62 \times 8\text{HP})$  LB/HR/ENG (APPROXIMATE).

Figure 1A2-1

Change 3 1A2-5

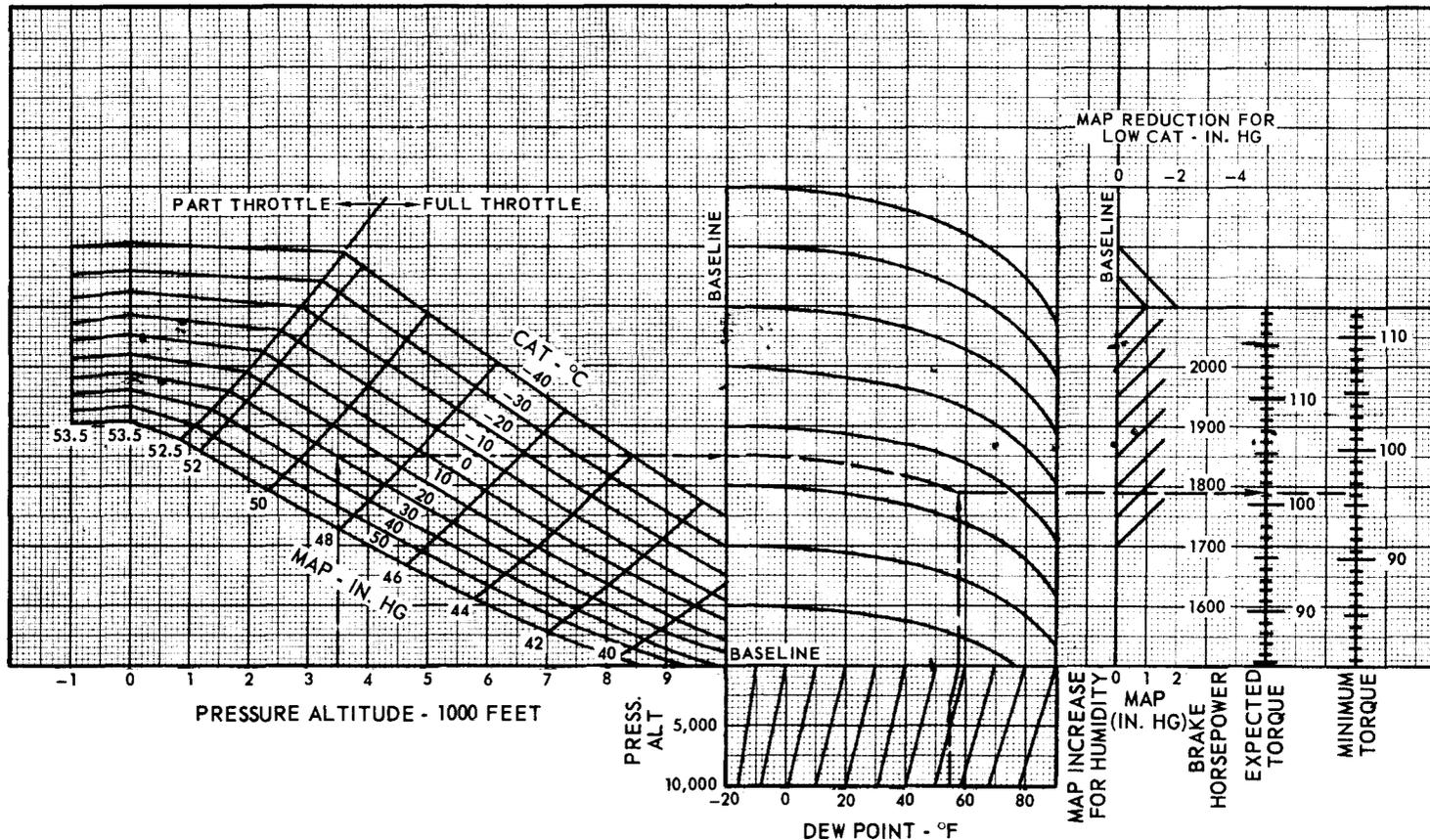
10,702C

Figure 1A2-2

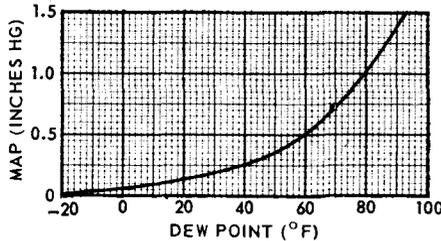
MODEL: T-29 A/B  
 DATE: 14 JULY 1961  
 DATA BASIS: FLIGHT TEST

**MAXIMUM DRY POWER AVAILABLE**  
 FUEL GRADE 100/130 OR 115/145  
 LOW BLOWER 2800 RPM AUTO RICH

ENGINE: R2800-97



ALLOWABLE INCREASE IN MAP DUE TO HUMIDITY (FOR PART THROTTLE OPERATION ONLY). DO NOT USE IN COLDER THAN STANDARD CONDITIONS WHEN MAP IS REDUCED FOR LOW CAT.



**NOTES:**

- (1) CAT EQUALS OAT + 1°C.
- (2) WHEN OPERATING CABIN PRESSURIZATION, (T-29B) TORQUE PRESSURE FOR RIGHT ENGINE WILL BE 4.0 PSI LOWER.
- (3) CHART BASED ON ZERO AIRSPEED. DO NOT EXCEED MAP LIMITS DURING TAKEOFF.
- (4) FUEL FLOW IS (0.84 x BHP) LB/HR/ENG (APPROXIMATE).

10,703C

Figure 1A2-3 deleted.

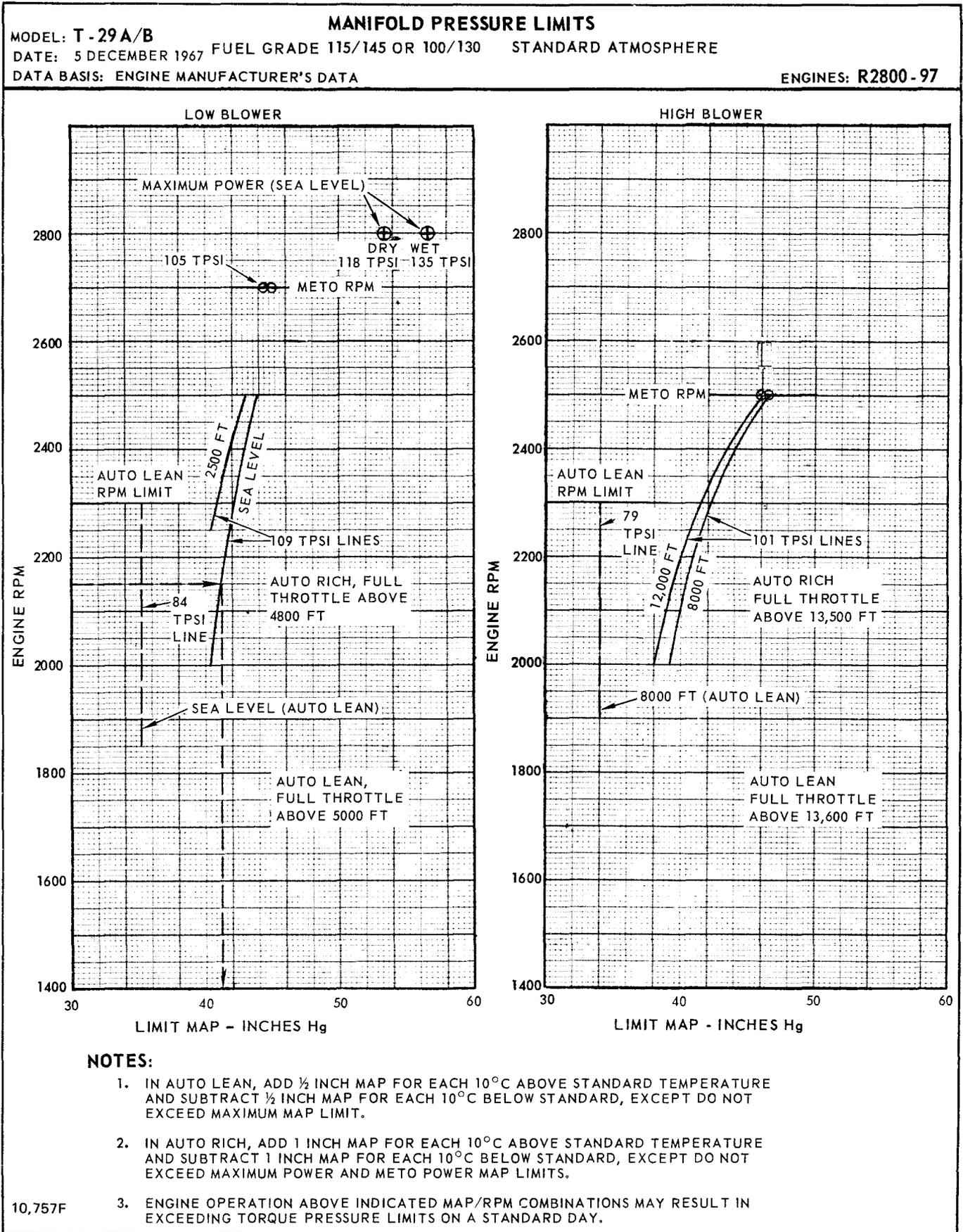


Figure 1A2-4

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**CLIMB POWER SCHEDULE**

MODEL: T-29A/B

2400 RPM - 1400 BHP  
MIXTURE AUTO RICH

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)	
	-30	-20	-10	0	+10	+20	+30	+40						
17,000	F.T.								HIGH	2400	92	905	945	
16,000	37.3	F.T.												
15,000	37.4	38.2	F.T.											
14,000	37.5	38.3	39.0	F.T.										
13,000	37.6	38.4	39.2	39.9	F.T.	F.T.	SEE NOTE (3)							
12,000	37.8	38.5	39.3	40.0	40.8	41.5								
11,000	34.1	38.7	39.4	40.2	40.9	41.6								
10,000	34.2	34.9	35.6	40.3	41.0	41.7								
9,000	34.3	35.0	35.7	36.3	41.2	41.9								
8,000	34.4	35.1	35.8	36.4	37.1	42.0								
7,000	34.5	35.2	35.9	36.5	37.2	37.8	38.5							
6,000	34.6	35.3	36.0	36.6	37.3	37.9	38.6	39.2	LOW	2400	92	830	865	
5,000	34.6	35.4	36.0	36.7	37.4	38.0	38.7	39.3						
4,000	34.7	35.4	36.1	36.8	37.5	38.1	38.8	39.4						
3,000	34.8	35.5	36.2	36.9	37.6	38.2	38.9	39.5						
2,000	34.9	35.6	36.3	37.0	37.7	38.3	39.0	39.6						
1,000	35.0	35.7	36.4	37.1	37.8	38.4	39.1	39.7						
S.L.	35.1	35.8	36.5	37.2	37.9	38.5	39.2	39.8						

**NOTES:**

- (1) F.T. INDICATES FULL THROTTLE.
- (2) NO CABIN PRESSURIZATION LOAD.
- (3) IF CARBURETOR AIR TEMPERATURE EXCEEDS 15°C, CONTINUE CLIMB IN LOW BLOWER.

10,772D

Figure 1A2-5  
Figures 1A2-6 and 1A2-7 deleted.

**CLIMB POWER SCHEDULE**

MODEL: T-29A/B  
DATE: 1 OCTOBER 1962  
DATA BASIS: ENGINE MANUFACTURER'S DATA

METO POWER  
MIXTURE AUTO RICH

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FEET)	M.A.P. (IN. HG.) AT C.A.T. (°C)						RPM	BHP	FUEL FLOW PER ENGINE (LB/HR)	TORQUE PRESSURE (PSI)
	-30	-20	-10	0	+10	+15				
20,000	35.4	36.2	34.8	35.3						
19,000	35.5	36.3	34.9	35.4	36.0					
18,000	37.8	36.4	37.2	35.5	36.1	36.7				
17,000	37.9	38.6	37.3	37.9	36.1	36.8				
16,000	40.2	38.4	39.4	38.0	38.6	36.9	2500	1200	875	76
15,000	40.3	41.1	41.9	40.3	38.8	39.3	2500	1300	943	82
14,000	40.3	41.1	42.0	42.8	41.2	41.8	2500	1400	1008	89
13,000	43.6	41.2	42.0	42.9	43.6	41.8				
12,000	43.6	44.5	45.3	42.9	43.7	44.3				
11,000	40.5	44.5	45.3	46.1	43.7	44.4	2500	1500	1064	95
10,000	40.7	41.5	45.3	46.2	47.0	44.4				
9,000	40.9	41.6	42.4	46.2	47.0	47.7				
8,000	40.9	41.8	42.5	43.2	47.2	47.7	2500	1600	1220	101
7,000	41.0	41.8	42.6	43.3	44.1	44.4				
6,000	41.0	41.8	42.7	43.4	44.2	44.5				
5,000	41.0	41.9	42.7	43.5	44.2	44.5				
4,000	41.1	41.9	42.7	43.5	44.3	44.5				
3,000	41.1	41.9	42.8	43.5	44.3	44.6	2700	1800	1365	105
2,000	41.1	42.0	42.8	43.6	44.3	44.6				
1,000	41.2	42.0	42.8	43.6	44.4	44.7				

**NOTES:**

- (1) OPERATION BELOW BROKEN LINE IS IN LOW BLOWER, ABOVE IS IN HIGH BLOWER.
- (2) NO CABIN PRESSURIZATION LOAD

10,732B

Figure 1A2-8

All data on pages 1A2-11 through 1A2-16 including figures 1A2-9 through 1A2-12 deleted.  
Change 3

MODEL: **T-29A**  
DATE: 14 JULY 1961  
DATA BASIS: ENGINE MANUFACTURER'S DATA

**CLIMB POWER SCHEDULE**  
METO POWER - 2600 RPM  
MIXTURE AUTO RICH



ENGINES: **R2800-97**

PRESSURE ALTITUDE (FEET)	MAP (IN.HG.) FOR CAT (°C)						BLOWER	BHP	FUEL FLOW PER ENGINE (LB/HR)	TORQUE PRESSURE (PSI)
	-30°C	-20°C	-10°C	0°C	+10°C	+15°C				
20,000	36.3	34.4	35.1							
19,000	38.7	36.9	37.6	35.7	36.3					
18,000	38.6	39.4	37.6	38.3	36.2	36.6	HIGH	1200	950	73
17,000	41.0	39.3	40.0	38.2	38.9	39.2	} HIGH	1300	1010	79
16,000	43.5	41.7	40.0	40.7	38.8	39.2				
15,000	43.5	44.4	42.4	43.2	41.4	41.7	} HIGH	1400	1078	85
14,000	43.6	44.4	42.4	43.2	44.0	41.7				
13,000	43.6	44.5	45.4	43.2	44.0	44.4	} HIGH	1500	1150	91
12,000	43.6	44.5	45.4	43.2	44.0	44.4				
11,000	43.7	44.6	45.5	43.2	44.0	44.4				
10,000	43.8	44.6	45.5	43.2	44.0	44.4				
9,000	41.1	44.7	45.6	43.2	44.0	44.4				
8,000	41.2	42.0	45.6	46.5	44.0	44.4	} HIGH	1600	1230	97
7,000	41.2	42.0	42.9	46.5	44.0	44.4				
6,000	41.3	42.1	42.9	43.7						
5,000	41.3	42.1	42.9	43.7			} HIGH	1600	1230	97
4,000	41.3	42.1	42.9	43.7						
3,000	41.3	42.1	42.9	43.7	44.5					
2,000	41.3	42.1	42.9	43.7	44.5					
1,000	41.3	42.1	42.9	43.7	44.5		} LOW	1800	1355	109
S L	41.3	42.1	42.9	43.7	44.5	44.9				

**NOTES:**

- (1) MAXIMUM MAP IN LOW BLOWER IS 45 IN.HG (S.L.) AT CAT GREATER THAN THOSE FOR WHICH MAP IS SHOWN, MAINTAIN LIMITING MAP WITH RESULTING DECREASE IN BHP
- (2) MAXIMUM CAT IN HIGH BLOWER IS 15°C.

10,773C

Figure 1A2-7

**CLIMB POWER SCHEDULE**



MODEL: **T - 29B**  
DATE: 1 OCTOBER 1962  
DATA BASIS: ENGINE MANUFACTURER'S DATA

METO POWER  
MIXTURE AUTO RICH

ENGINES: **R2800 - 97**

PRESSURE ALTITUDE (FEET)	M.A.P. (IN. HG.) AT C.A.T. (°C)						RPM	BHP	FUEL FLOW PER ENGINE (LB/HR)	TORQUE PRESSURE (PSI)
	-30	-20	-10	0	+10	+15				
20,000	35.4	36.2	34.8	35.3						
19,000	35.5	36.3	34.9	35.4	36.0					
18,000	37.8	36.4	37.2	35.5	36.1	36.7				
17,000	37.9	38.6	37.3	37.9	36.1	36.8				
16,000	40.2	38.4	39.4	38.0	38.6	36.9	2500	1200	875	76
15,000	40.3	41.1	41.9	40.3	38.8	39.3	2500	1300	943	82
14,000	40.3	41.1	42.0	42.8	41.2	41.8	2500	1400	1008	89
13,000	43.6	41.2	42.0	42.9	43.6	41.8				
12,000	43.6	44.5	45.3	42.9	43.7	44.3				
11,000	40.5	44.5	45.3	46.1	43.7	44.4	2500	1500	1064	95
10,000	40.7	41.5	45.3	46.2	47.0	44.4				
9,000	40.9	41.6	42.4	46.2	47.0	47.7				
8,000	40.9	41.8	42.5	43.2	47.2	47.7	2500	1600	1220	101
7,000	41.0	41.8	42.6	43.3	44.1	44.4				
6,000	41.0	41.8	42.7	43.4	44.2	44.5				
5,000	41.0	41.9	42.7	43.5	44.2	44.5				
4,000	41.1	41.9	42.7	43.5	44.3	44.5				
3,000	41.1	41.9	42.8	43.5	44.3	44.6	2700	1800	1365	105
2,000	41.1	42.0	42.8	43.6	44.3	44.6				
1,000	41.2	42.0	42.8	43.6	44.4	44.7				

**NOTES:**

- (1) OPERATION BELOW BROKEN LINE IS IN LOW BLOWER, ABOVE IS IN HIGH BLOWER.
- (2) NO CABIN PRESSURIZATION LOAD

10,732A

Figure 1A2-8

**POWER SCHEDULE**

MODEL: T-29A/B

900 BHP/ENG

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C				
25,000	F.T.											
24,000	F.T.											
23,000	F.T.											
22,000	28.7	F.T.										
21,000	28.7	29.2	F.T.									
20,000	28.7	29.2	29.8	F.T.		F.T.						
19,000	28.7	29.3	29.9	30.4	30.9	F.T.			HIGH	2300	62	450
18,000	28.8	29.3	29.9	30.5	30.9	31.5	F.T.		F.T.			
17,000	25.8	26.3	30.0	30.5	31.1	31.5	32.0	32.5				
16,000	26.0	26.5	27.0	30.5	31.1	31.6	32.2	32.5				
15,000	26.4	26.7	27.2	27.6	31.1	31.7	32.2	32.7				
14,000	26.6	27.1	27.3	27.9	28.2	28.7	32.3	32.8	HIGH	2200	65	441
13,000	26.9	27.3	27.8	28.0	28.5	28.9	29.3	32.8				
12,000	27.7	27.6	28.0	28.5	29.0	29.2	29.7	30.0	LOW	2300	62	437
11,000	27.9	28.5	28.3	28.9	29.2	29.7	29.8	30.3	LOW	2200	65	426
10,000	28.8	28.7	29.3	29.1	29.6	29.9	30.4	30.9	LOW	2100	69	417
9,000	29.0	29.6	29.5	30.0	29.8	30.3	30.5	31.0				
8,000	29.2	29.8	30.4	30.2	30.8	31.3	31.0	31.6	LOW	2000	71	410
7,000	29.4	30.0	30.6	31.2	31.0	31.6	32.1	31.8				
6,000	29.7	30.3	30.9	31.4	32.0	32.6	32.3	32.8	LOW	1900	75	403
5,000	29.9	30.5	31.1	31.7	32.2	32.8	33.4	33.1				
4,000	30.1	30.7	31.3	31.9	32.5	33.0	33.6	34.2				
3,000	30.3	30.9	31.5	32.1	32.7	33.3	33.8	34.4				
2,000	30.5	31.1	31.8	32.4	32.9	33.5	34.1	34.6	LOW	1800	79	394
1,000	30.7	31.4	32.0	32.6	33.2	33.8	34.3	34.9				
S.L.	30.9	31.6	32.2	32.8	33.5	34.0	34.5	35.1				

**NOTES:**

- (1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.
- (2) F.T. INDICATES FULL THROTTLE.
- (3) NO CABIN PRESSURIZATION LOAD.

10,763C

Figure 1A2-13

**POWER SCHEDULE**

MODEL: T-29A/B

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

950 BHP/ENG

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C				
25,000												
24,000												
23,000												
22,000												
21,000	F.T.	F.T.										
20,000	29.7	30.3	F.T.									
19,000	29.7	30.3	30.9	F.T.	F.T.							
18,000	29.8	30.4	31.0	34.1	32.0	F.T.						
17,000	29.8	30.4	31.0	31.6	32.0	32.6	F.T.	F.T.	HIGH	2300	62	470
16,000	26.8	27.3	31.1	31.6	32.2	32.6	33.1	33.6				
15,000	27.1	27.4	28.0	31.7	32.3	32.8	33.4	33.6				
14,000	27.4	27.8	28.3	28.6	32.3	32.9	33.4	34.0				
13,000	27.6	28.1	28.5	29.0	29.3	29.8	33.5	34.0	HIGH	2200	68	459
12,000	28.2	28.8	28.9	29.2	29.7	29.9	30.4	34.1				
11,000	28.9	29.0	29.5	29.6	30.1	30.4	30.9	31.0	LOW	2300	65	455
10,000	29.1	29.7	29.7	30.3	30.3	30.8	31.1	31.6	LOW	2200	68	444
9,000	29.3	29.9	30.5	30.5	31.0	31.6	31.5	32.0				
8,000	29.5	30.1	30.7	31.2	31.2	31.7	32.3	32.2	LOW	2100	72	436
7,000	29.7	30.3	30.9	31.5	32.0	32.6	32.5	33.0				
6,000	29.9	30.5	31.1	31.7	32.3	32.8	33.4	33.2	LOW	2000	75	428
5,000	30.1	30.7	31.3	31.9	32.5	33.1	33.6	34.2				
4,000	30.3	30.9	31.5	32.1	32.7	33.3	33.8	34.4				
3,000	30.5	31.1	31.7	32.3	32.9	33.5	34.1	34.6				
2,000	30.7	31.4	32.0	32.6	33.2	33.7	34.3	34.9				
1,000	30.9	31.6	32.2	32.8	33.4	34.0	34.5	35.1				
S.L.	31.1	31.8	32.2	33.0	33.6	34.2	34.7	35.3				

**NOTES:**

- (1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.
- (2) F.T. INDICATES FULL THROTTLE.
- (3) NO CABIN PRESSURIZATION LOAD.

10,705A

Figure 1A2-14

**POWER SCHEDULE**

MODEL: T-29A/B

1000 BHP/ENG

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C				
21,000	F.T.											
20,000	30.6	F.T.										
19,000	30.7	31.3	F.T.		F.T.							
18,000	30.8	31.4	31.9	32.5	F.T.		F.T.		HIGH	2300	69	490
17,000	30.8	31.5	32.1	32.5	33.1	33.7	F.T.					
16,000	27.8	31.5	32.1	32.7	33.3	33.7	34.3	F.T.				
15,000	27.9	28.4	32.2	32.8	33.3	33.9	34.3	34.8				
14,000	28.1	28.6	29.1	32.8	33.4	34.0	34.6	34.9				
13,000	28.3	28.9	29.4	29.8	33.4	34.0	34.6	35.1				
12,000	29.3	29.9	29.6	30.1	30.4	31.0	34.7	35.2	HIGH	2200	72	480
11,000	29.2	30.0	30.6	30.3	30.8	31.3	31.6	35.2				
10,000	29.9	30.0	30.6	31.2	31.7	31.5	32.0	32.3	LOW	2300	69	474
9,000	30.1	30.7	30.8	31.4	31.8	32.4	32.2	32.7	LOW	2200	72	463
8,000	30.3	31.0	31.5	31.5	32.1	32.7	33.0	32.9	LOW	2200	72	463
7,000	30.5	31.2	31.8	32.4	32.9	32.9	33.4	33.6	LOW	2100	75	454
6,000	30.7	31.4	32.0	32.6	33.2	33.8	33.6	34.2	LOW	2000	79	447
5,000	30.9	31.6	32.2	32.8	33.4	34.0	34.6	35.1				
4,000	31.1	31.8	32.4	33.0	33.6	34.2	34.8	35.3				
3,000	31.4	32.0	32.6	33.2	33.8	34.4	35.0	35.6				
2,000	31.6	32.2	32.9	33.5	34.1	34.7	35.3	35.8	LOW	1900	83	440
1,000	31.8	32.4	33.1	33.7	34.3	34.9	35.5	36.1				
S.L.	32.0	32.6	33.3	33.9	34.5	35.1	35.7	36.3				

**NOTES:**

- (1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.
- (2) F.T. INDICATES FULL THROTTLE.
- (3) NO CABIN PRESSURIZATION LOAD.

10,764C

Figure 1A2-15

**POWER SCHEDULE**

**MODEL: T-29A/B**

**DATE: 20 NOVEMBER 1973**

**DATA BASIS: ENGINE MANUFACTURER'S DATA**

**1050 BHP/ENG**

**ENGINES: R2800 - 97**

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C				
25,000												
24,000												
23,000												
22,000												
21,000												
20,000	F.T.											
19,000	31.8	F.T.										
18,000	31.9	32.4	F.T.	F.T.								
17,000	31.9	32.6	33.1	33.7	F.T.							
16,000	32.0	32.6	33.2	33.7	34.3	F.T.			HIGH	2300	72	510
15,000	28.7	32.7	33.3	33.9	34.3	34.9	F.T.	F.T.				
14,000	28.8	29.4	33.3	34.0	34.6	35.2	35.4	36.0				
13,000	29.1	29.6	30.1	34.0	34.6	35.2	35.8	36.0				
12,000	29.6	29.8	30.4	30.8	31.3	35.3	35.9	36.5				
11,000	29.8	30.4	30.5	31.1	31.4	32.0	35.9	36.5	HIGH	2200	75	500
10,000	29.9	30.5	31.1	31.7	31.8	32.1	32.6	36.6				
9,000	30.1	30.7	31.3	31.9	32.5	32.5	33.1	33.3	LOW	2300	72	490
8,000	30.2	30.9	31.5	32.1	32.6	33.2	33.3	33.8	LOW	2200	75	482
7,000	30.4	31.0	31.6	32.2	32.8	33.4	33.9	34.5				
6,000	30.6	31.2	31.8	32.4	33.0	33.6	34.1	34.7				
5,000	30.7	31.3	32.0	32.6	33.1	33.7	34.3	34.9				
4,000	30.9	31.5	32.1	32.7	33.3	33.9	34.5	35.0				
3,000	31.0	31.7	32.3	32.9	33.5	34.1	34.7	35.2				
2,000	31.2	31.8	32.4	33.1	33.7	34.2	34.8	35.4				
1,000	31.3	32.0	32.6	33.2	33.8	34.4	35.0	35.6				
S.L.	31.5	32.2	32.7	33.4	34.0	34.6	35.2	35.8				

**NOTES:**

- (1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.
- (2) F.T. INDICATES FULL THROTTLE.
- (3) NO CABIN PRESSURIZATION LOAD.

10,706C

Figure 1A2-16

**POWER SCHEDULE**

**MODEL:** T-29A/B

**1100 BHP/ENG**

**DATE:** 20 NOVEMBER 1973

**DATA BASIS:** ENGINE MANUFACTURER'S DATA

**ENGINES:** R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)							
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C											
21,000	F.T.																		
20,000	F.T.																		
19,000	32.9	F.T.																	
18,000	32.9	33.6	F.T.																
17,000	32.8	33.6	34.3	F.T.															
16,000	33.0	33.6	34.3	34.9	F.T.								HIGH	2300	75	532			
15,000	33.1	33.7	34.4	35.0	35.6	F.T.													
14,000	33.2	33.8	34.5	35.2	35.8	35.9	36.8	F.T.											
13,000	29.9	30.5	34.6	35.3	35.9	36.5	36.8	37.5											
12,000	30.3	30.9	31.2	31.8	32.3	36.7	37.3	37.5											
11,000	30.5	31.0	31.6	31.9	32.4	33.1	37.4	38.0								HIGH	2200	79	518
10,000	30.7	31.4	31.7	32.3	32.9	33.2	33.7	38.1											
9,000	30.8	31.5	32.1	32.7	33.1	33.7	33.9	34.5								LOW	2300	75	514
8,000	31.0	31.7	32.3	32.9	33.5	33.8	34.3	34.7								LOW	2200	79	502
7,000	31.2	31.8	32.5	33.1	33.7	34.3	34.8	35.0											
6,000	31.3	31.9	32.6	33.2	33.8	34.4	35.0	35.6											
5,000	31.5	32.1	32.8	33.4	34.0	34.6	35.2	35.8											
4,000	31.7	32.3	33.0	33.6	34.2	34.8	35.4	36.0											
3,000	31.8	32.4	33.2	33.7	34.3	34.9	35.5	36.1								LOW	2100	83	493
2,000	32.0	32.6	33.3	33.9	34.5	35.1	35.7	36.3											
1,000	32.2	32.8	33.5	34.1	34.7	35.3	35.9	36.5											
S.L.	32.4	33.0	33.7	34.3	34.9	35.5	36.1	36.7											

**NOTES:**

- (1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.
- (2) F.T. INDICATES FULL THROTTLE.
- (3) NO CABIN PRESSURIZATION LOAD.

10,765E

Figure 1A2-17

**POWER SCHEDULE**

**MODEL:** T-29A/B

**DATE:** 20 NOVEMBER 1973

**DATA BASIS:** ENGINE MANUFACTURER'S DATA

**1150 BHP/ENG**

**ENGINES:** R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	NOMINAL FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C				
13,000	30.7	F.T.										
12,000	30.8	31.4	F.T.									
11,000	31.2	31.8	32.1	F.T.	F.T.							
10,000	31.3	31.9	32.6	32.8	33.4	F.T.		LOW	2300	79	535	
9,000	31.4	32.1	32.7	33.3	33.5	34.1	F.T.	F.T.				
8,000	31.6	32.2	32.8	33.4	34.1	34.6	34.8	35.4				
7,000	31.7	32.3	33.0	33.6	34.2	34.8	35.4	35.5				
6,000	31.8	32.5	33.1	33.7	34.3	34.9	35.5	36.1				
5,000	32.0	32.6	33.2	33.9	34.5	35.1	35.7	36.3				
4,000	32.1	32.7	33.4	34.0	34.6	35.2	35.8	36.4				
3,000	32.2	32.9	33.5	34.1	34.8	35.4	36.0	36.6	LOW	2200	83	520
2,000	32.3	33.0	33.7	34.3	34.9	35.5	36.1	36.7				
1,000	32.5	33.1	33.8	34.4	35.0	35.7	36.3	36.9				
S.L.	32.6	33.3	33.9	34.6	35.2	35.8	36.4	37.0				

**NOTES:**

- (1) MANUAL LEAN MIXTURE SETTING ESTABLISHED BY 7 PSI TORQUE PRESSURE DROP FROM BEST POWER.
- (2) F.T. INDICATES FULL THROTTLE.
- (3) NO CABIN PRESSURIZATION LOAD.

10,707C

Figure 1A2-18

**POWER SCHEDULE**

MODEL: T-29A/B

1200 BHP/ENG

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C					
20,000	33.7	F.T.											
19,000	33.5	34.4	F.T.	F.T.									
18,000	33.5	34.2	35.1	35.8	F.T.				HIGH	2500	76	750	785
17,000	33.6	34.2	34.9	35.6	36.5	F.T.							
16,000	29.6	34.3	34.9	35.6	36.2	37.1							
15,000	29.9	30.3	35.0	35.6	36.3	36.9							
14,000	30.0	30.6	31.0	35.7	36.3	36.9							
13,000	30.5	30.7	31.3	31.7	32.3	37.0			HIGH	2400	79	735	770
12,000	31.0	31.2	31.8	32.0	32.4	32.9							
11,000	31.1	31.7	31.9	32.5	32.7	33.3	33.6	34.2					
10,000	31.6	31.8	32.4	32.7	33.2	33.4	34.0	34.3	LOW	2500	76	700	730
9,000	31.7	32.3	32.5	33.2	33.8	33.9	34.5	34.6	LOW	2400	79	685	715
8,000	31.8	32.5	33.1	33.7	33.9	34.5	34.6	35.2	LOW	2300	83	675	705
7,000	32.0	32.6	33.2	33.9	34.5	34.6	35.1	35.7					
6,000	32.1	32.7	33.4	34.0	34.6	35.2	35.8	35.8	LOW	2200	86	665	695
5,000	32.2	32.9	33.5	34.2	34.8	35.4	36.0	36.6					
4,000	32.4	33.0	33.7	34.3	34.9	35.5	36.1	36.7					
3,000	32.5	33.1	33.8	34.4	35.1	35.7	36.3	36.9					
2,000	32.6	33.3	33.9	34.6	35.2	35.8	36.4	37.0	LOW	2100	90	650	680
1,000	32.8	33.4	34.1	34.7	35.3	36.0	36.6	37.2					
S.L.	32.9	33.6	34.2	34.9	35.5	36.1	36.7	37.3					

**NOTES:**

- (1) AUTO RICH MIXTURE, FUEL FLOW MAY BE MANUALLY ADJUSTED, IF REQUIRED.
- (2) MINIMUM FUEL FLOWS ARE ENGINE MANUFACTURER'S DATA.
- (3) F.T. INDICATES FULL THROTTLE.
- (4) NO CABIN PRESSURIZATION LOAD.
- (5) MAXIMUM CAT 15°C IN HIGH BLOWER.

10,766D

Figure 1A2-19

**POWER SCHEDULE**

MODEL: T-29A/B

1300 BHP/ENG

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C					
19,000	35.8	F.T.											
18,000	35.9	36.6	F.T.										
17,000	35.6	36.2	37.3	F.T.									
16,000	35.6	36.3	37.1	37.9	F.T.	F.T.		HIGH	2500	82	845	880	
15,000	35.7	36.3	37.0	37.7	38.5	39.2							
14,000	31.6	36.4	36.9	37.6	38.3	38.8							
13,000	32.0	32.4	33.0	37.6	38.3	38.9							
12,000	32.1	32.8	33.1	33.7	38.4	38.9							
11,000	32.5	33.2	33.5	33.8	34.4	39.0		HIGH	2400	86	805	840	
10,000	33.2	33.3	33.9	34.3	34.9	35.1	35.7						
9,000	33.3	34.0	34.1	34.7	35.0	35.6	35.8	36.4	LOW	2500	82	765	800
8,000	33.4	34.1	34.7	35.4	35.4	36.1	36.3	36.9	LOW	2400	86	745	780
7,000	33.5	34.1	34.8	35.5	36.1	36.2	36.8	37.0					
6,000	33.5	34.2	34.9	35.5	36.2	36.8	36.9	37.5	LOW	2300	89	730	760
5,000	33.6	34.3	35.0	35.6	36.3	36.9	37.5	38.1					
4,000	33.7	34.4	35.0	35.7	36.3	37.0	37.6	38.2					
3,000	33.8	34.4	35.1	35.8	36.4	37.1	37.7	38.3					
2,000	33.8	34.5	35.2	35.9	36.5	37.2	37.8	38.4	LOW	2200	94	715	745
1,000	33.9	34.6	35.3	35.9	36.6	37.2	37.9	38.5					
S.L.	34.0	34.7	35.4	36.0	36.7	37.3	38.0	38.6					

**NOTES:**

- (1) AUTO RICH MIXTURE, FUEL FLOW MAY BE MANUALLY ADJUSTED, IF REQUIRED.
- (2) MINIMUM FUEL FLOWS ARE ENGINE MANUFACTURER'S DATA.
- (3) F.T. INDICATES FULL THROTTLE.
- (4) NO CABIN PRESSURIZATION LOAD.
- (5) MAXIMUM CAT 15°C IN HIGH BLOWER.

10,767D

Figure 1A2-20  
Figure 1A2-21 deleted.

**POWER SCHEDULE**

**MODEL: T-29A/B**

**1400 BHP/ENG**

**DATE: 20 NOVEMBER 1973**

**DATA BASIS: ENGINE MANUFACTURER'S DATA**

**ENGINES: R2800 - 97**

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C					
17,000	38.0	F.T.											
16,000	38.1	38.9	F.T.										
15,000	38.3	39.1	39.8	F.T.	F.T.								
14,000	38.4	39.2	40.0	40.7	41.5	F.T.							
13,000	33.5	39.3	40.1	40.9	41.6	42.3							
12,000	33.6	34.3	40.2	41.0	41.7	42.5		HIGH	2500	89	930	970	
11,000	34.1	34.4	35.1	41.1	41.9	42.6							
10,000	34.2	34.9	35.6	35.8	42.0	42.8							
9,000	34.3	35.0	35.7	36.3	36.5	37.2							
8,000	34.4	35.1	35.8	36.4	37.1	37.3	37.9						
7,000	34.5	35.2	35.9	36.5	37.2	37.8	38.5	38.6	LOW	2500	89	850	890
6,000	34.6	35.3	36.0	36.6	37.3	37.9	38.6	39.2					
5,000	34.6	35.4	36.0	36.7	37.4	38.0	38.7	39.3					
4,000	34.7	35.4	36.1	36.8	37.5	38.1	38.8	39.4					
3,000	34.8	35.5	36.2	36.9	37.6	38.2	38.9	39.5	LOW	2400	92	830	865
2,000	34.9	35.6	36.3	37.0	37.7	38.3	39.0	39.6					
1,000	35.0	35.7	36.4	37.1	37.8	38.4	39.1	39.7					
S.L.	35.1	35.8	36.5	37.2	37.9	38.5	39.2	39.8					

**NOTES:**

- (1) AUTO RICH MIXTURE, FUEL FLOW MAY BE MANUALLY ADJUSTED, IF REQUIRED.
- (2) MINIMUM FUEL FLOWS ARE ENGINE MANUFACTURER'S DATA.
- (3) F.T. INDICATES FULL THROTTLE.
- (4) NO CABIN PRESSURIZATION LOAD.
- (5) MAXIMUM CAT 15°C IN HIGH BLOWER.

10,768D

Figure 1A2-22  
Figure 1A2-23 deleted.

**POWER SCHEDULE**

MODEL: T-29A/B

1500 BHP/ENG

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C					
16,000	40.0	F.T.											
15,000	40.1	40.9	F.T.										
14,000	40.1	41.0	41.8	F.T.									
13,000	40.2	41.0	41.8	42.6	F.T.	F.T.							
12,000	40.3	41.1	41.9	42.7	43.5	44.3							
11,000	35.6	41.2	42.0	42.8	43.6	44.3		HIGH	2500	95	1020	1065	
10,000	35.9	36.4	37.1	42.9	43.7	44.4							
9,000	36.0	36.8	37.2	37.9	43.8	44.5							
8,000	36.1	36.9	37.6	38.0	38.7	44.6							
7,000	36.2	37.0	37.7	38.4	38.8	39.5	40.1						
6,000	36.3	37.1	37.8	38.5	39.2	39.9	40.2	40.9	LOW	2500	95	935	975
5,000	36.4	37.2	37.9	38.6	39.3	40.0	40.7	41.0					
4,000	36.5	37.3	38.0	38.7	39.4	40.1	40.8	41.5					
3,000	36.6	37.4	38.1	38.8	39.5	40.2	40.9	41.6					
2,000	36.7	37.5	38.2	38.9	39.6	40.3	41.0	41.7	LOW	2400	99	905	945
1,000	36.8	37.6	38.3	39.0	39.7	40.4	41.1	41.8					
S.L.	36.9	37.7	38.4	39.1	39.8	40.5	41.2	41.9					

**NOTES:**

- (1) AUTO RICH MIXTURE, FUEL FLOW MAY BE MANUALLY ADJUSTED, IF REQUIRED.
- (2) MINIMUM FUEL FLOWS ARE ENGINE MANUFACTURER'S DATA.
- (3) F.T. INDICATES FULL THROTTLE.
- (4) NO CABIN PRESSURIZATION LOAD.
- (5) MAXIMUM CAT 15°C IN HIGH BLOWER.

10,769D

Figure 1A2-24  
Figure 1A2-25 deleted.

**POWER SCHEDULE**

MODEL: T-29A/B

1600 BHP/ENG

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C					
14,000	42.4	43.2	F.T.										
13,000	42.4	43.3	44.1	F.T.									
12,000	42.5	43.3	44.2	45.0	F.T.								
11,000	42.5	43.4	44.3	45.1	45.9	F.T.							
10,000	37.4	43.5	44.3	45.1	46.0	46.8		HIGH	2500	101	1120	1170	
9,000	37.4	38.2	44.4	45.2	46.0	46.8							
8,000	37.7	38.4	39.1	45.3	46.1	46.9							
7,000	37.9	38.7	39.5	39.9	46.2	47.0							
6,000	38.2	39.0	39.7	40.5	40.7	41.4							
5,000	38.4	39.2	40.0	40.7	41.5	41.6	42.3						
4,000	38.7	39.5	40.2	41.0	41.7	42.5	42.4	43.1					
3,000	38.9	39.7	40.5	41.3	42.0	42.7	43.5	43.2	LOW	2500	101	1020	1065
2,000	39.2	40.0	40.8	41.5	42.3	43.0	43.8	44.5					
1,000	39.4	40.2	41.0	41.8	42.6	43.3	44.0	44.8	LOW	2400	105	990	1035
S.L.	39.7	40.5	41.3	42.1	42.8	43.6	44.3	45.0					

**NOTES:**

- (1) AUTO RICH MIXTURE.
- (2) FUEL FLOW MAY BE MANUALLY ADJUSTED TO MINIMUM FUEL FLOW VALUE IF REQUIRED BY EMERGENCY RANGE CONDITIONS.
- (3) F.T. INDICATES FULL THROTTLE.
- (4) NO CABIN PRESSURIZATION LOAD.
- (5) MAXIMUM CAT 15°C IN HIGH BLOWER.

10,770D

Figure 1A2-26  
Figure 1A2-27 deleted.

**POWER SCHEDULE**

MODEL: T-29A/B

1700 BHP/ENG

DATE: 20 NOVEMBER 1973

DATA BASIS: ENGINE MANUFACTURER'S DATA

ENGINES: R2800 - 97

PRESSURE ALTITUDE (FT)	MANIFOLD PRESSURE (IN. HG) CARBURETOR AIR TEMPERATURE								BLOWER	RPM	NOMINAL TORQUE PRESSURE (PSI)	MINIMUM FUEL FLOW (PPH)	DESIRED FUEL FLOW (PPH)
	-30°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C					
11,000	39.5	F.T.											
10,000	39.7	40.5	F.T.										
9,000	39.8	40.6	41.4	F.T.									
8,000	39.4	40.7	41.5	42.2	F.T.								
7,000	39.5	40.3	41.1	42.4	43.1	F.T.	F.T.	LOW	2700	100	1160	210	
6,000	39.6	40.4	41.2	42.0	43.2	44.0	44.7						210
5,000	39.7	40.5	41.3	42.1	42.8	44.1	44.9						45.6
4,000	39.8	40.6	41.4	42.2	42.9	43.7	44.4						45.7
3,000	39.9	40.7	41.5	42.3	43.0	43.8	44.5						45.3
2,000	40.0	40.8	41.6	42.4	43.1	43.9	44.6	LOW	2500	108	1100	1150	
1,000	40.1	40.9	41.7	42.5	43.2	44.0	44.7						45.5
S.L.	40.1	41.0	41.8	42.5	43.3	44.1	44.8						45.6

**NOTES:**

- (1) AUTO RICH MIXTURE.
- (2) FUEL FLOW MAY BE MANUALLY ADJUSTED TO MINIMUM FUEL FLOW VALUE IF REQUIRED BY EMERGENCY RANGE CONDITIONS.
- (3) F.T. INDICATES FULL THROTTLE.
- (4) NO CABIN PRESSURIZATION LOAD.

*SEE CAPS  
JSP  
1T29A-1540*

10,771D

Figure 1A2-28

All data on pages 1A2-29 through 1A2-32 and figure 1A2-29 deleted.

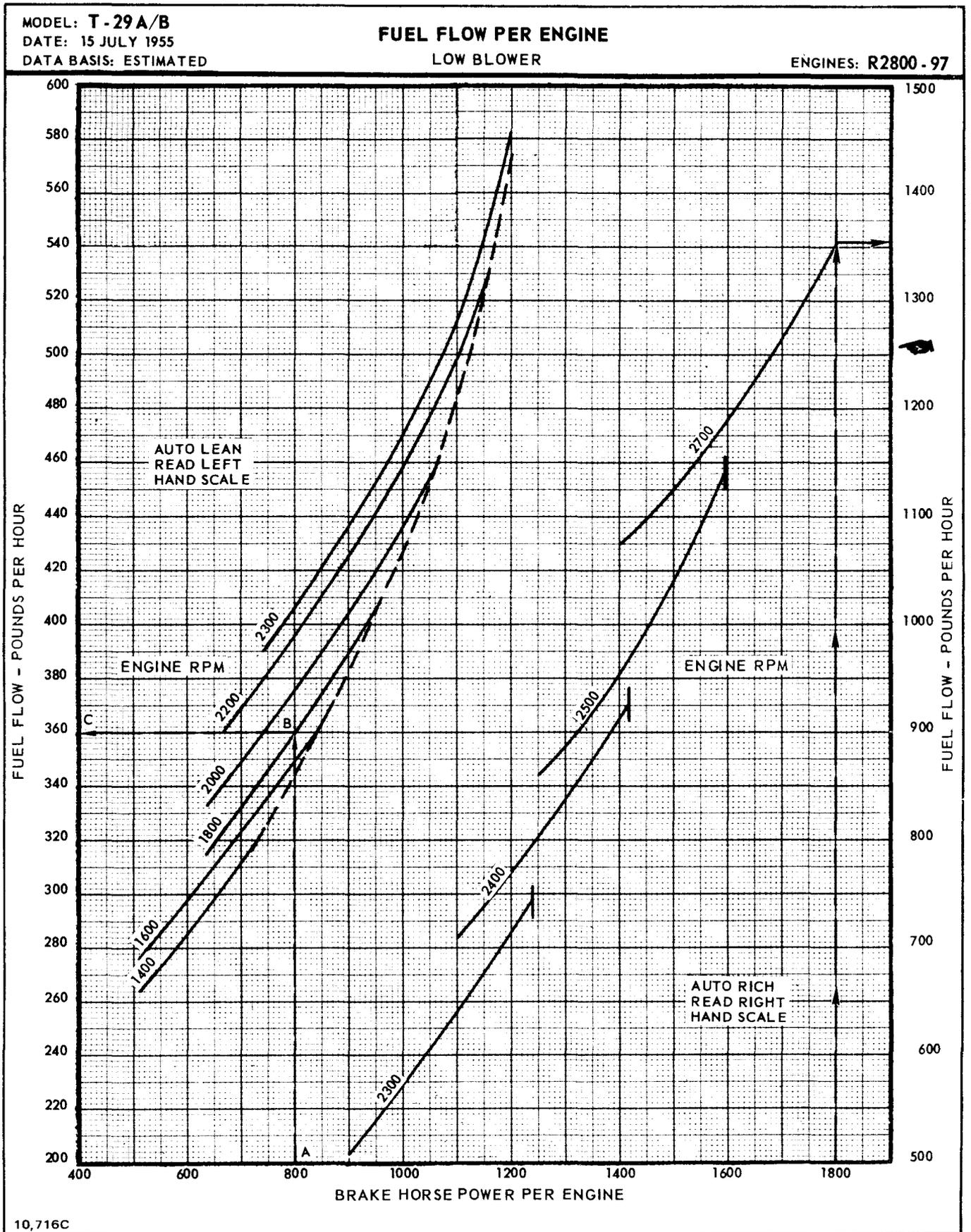
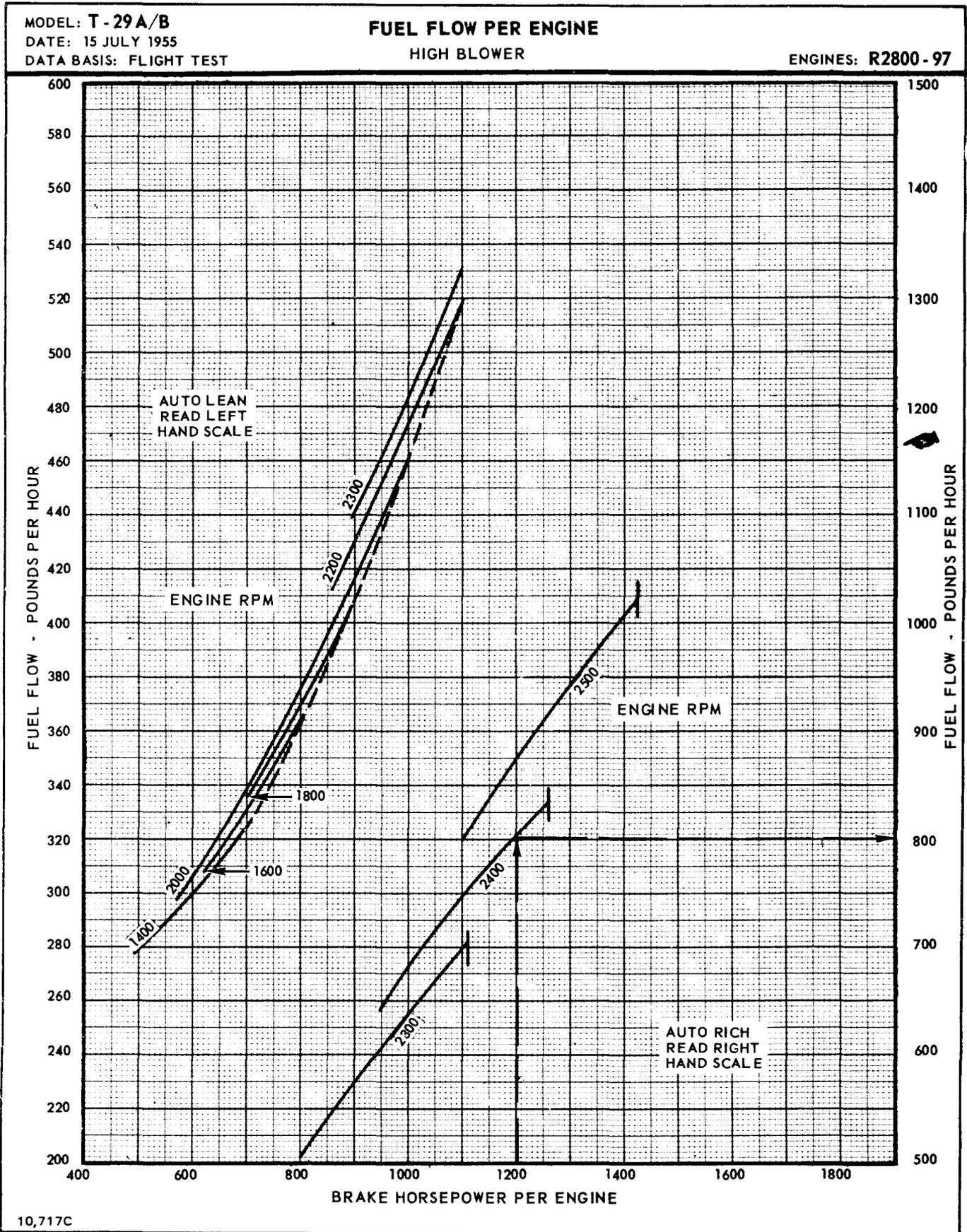


Figure 1A2-30



10,717C

Figure 1A2-31  
All data on page 1A2-35/1A2-36 deleted.

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The symbol \* indicates an illustration

**TAKEOFF****DISCUSSION OF TAKEOFF TERMS**

The relationship of takeoff terms (figure 1A3-1) illustrates the relationship of the terms used in the takeoff charts. The upper chart represents the sum of the distance required to accelerate on two engines to critical engine failure speed, experience an engine failure and either continue to accelerate on one engine to takeoff speed or stop, using brakes only, in the same distance. On the lower chart Curve A shows the two engine acceleration to takeoff speed and the distance traversed is the ground run.

Curves B and D show that from the critical engine failure speed point the distance to accelerate on one engine to takeoff speed and the distance to stop are the same. This distance added to the distance required to reach critical engine failure speed is called the critical field length. Curve C shows that the refusal speed is the highest speed from which the takeoff may be aborted and the aircraft brought to a stop within the remaining runway length. The acceleration check point is a predetermined point, based on time or distance, at which the acceleration check speed must be attained. If runway length and critical field length were equal, Curves C and D

would coincide and the refusal speed would be the same as the critical engine failure speed. In this case, the acceleration check speed will be lower than the critical engine failure speed.

### Ground Effect

Ground effect, in general, refers to a reduction in the overall drag of an airplane when operated near the ground. The degree of drag reduction will vary with distance of the wing or supporting surface from the ground, being greatest when the wing is at ground level, and will have disappeared, for all practical purposes, when the wing is one-half its span above the ground. The reduction in drag is also greatest at low velocities and becomes less as velocity increases. All of the takeoff charts pertaining to the ground run consider the reduction in drag due to ground effect.

### MAXIMUM TAKEOFF GROSS WEIGHT

Safe operation of the aircraft requires that takeoffs not be attempted at gross weights for which acceleration, rate of climb, or obstacle clearance capability are marginal. There are four primary factors which must be considered when determining a safe limit for the takeoff gross weight.

1. The ability of the structure to withstand taxiing loads and inflight maneuvering loads is shown as design takeoff gross weights on the Gross Weight Limitation Chart in Section V.
2. The ability to takeoff or stop within the available runway is shown on the Critical Field Length Charts (figures 1A3-8, 1A3-11, 1A3-14, and 1A3-17).
3. The ability to have adequate rate of climb when airborne is shown on the Gross Weight Limited by One-Engine Climb Performance Chart (figure 1A3-3).
4. The ability to clear obstacles within the takeoff corridor is determined by the Climbout Factor Charts and the Climbout Flight Path Charts (figures 1A3-21 through 1A3-32).

For a given set of takeoff conditions, each of these four considerations will permit a different gross weight. Any one of the four weights may be the lowest, depending on the conditions. For this reason, all four factors must be considered for each takeoff, even though in many cases one or more of them may be eliminated after cursory examination. The lowest weight determined by these factors will be the maximum takeoff gross weight.

### TAKEOFF PLANNING

An engine failure, while admittedly rare, remains a possibility, especially under takeoff (high power) conditions. If an engine should fail during the early part of a takeoff run, there is no problem — cut the remaining engine and stop. However, under certain conditions of weight, speed, and runway length it is desirable to continue the takeoff. One of the purposes of the normal takeoff charts is to provide the neces-

sary information to determine a desirable loading and wing flap setting and then to determine the amount of runway required and the rate of climb expected if an engine should fail during a late phase of the takeoff. In flight planning, the larger wing flap setting should be considered first. This is because the greater wing flap extensions result in reduced takeoff speed and required field length. The flap setting will be considered acceptable of (1) the rate of climb on the gross weight limited by climb chart is acceptable, and (2) if the critical field length found is equal to or less than the runway field length under consideration. If the rate of climb is too low, a lesser wing flap setting will then require a re-evaluation of the takeoff field length. If, after choosing the smallest recommended wing flap setting to obtain an acceptable initial rate of climb, it is found that the actual available runway field length is less than that shown on the chart, a reduction in gross weight is desirable. It is recommended that the airplane not be loaded so that the critical field length exceeds the available runway length. From the definition it can be seen that critical engine failure speed is required only when critical field length is equal to the available runway length, and since critical engine failure speed and refusal speed are equal in this case, then refusal speed is the only speed that need be monitored to determine whether or not to abort when encountering engine failure during takeoff. When the available field length is so much greater than the critical field length that the refusal speed is higher than takeoff speed, then the only speed that need be monitored during takeoff run is takeoff speed, and the decision to abort or continue the takeoff is determined by whether or not the airplane is airborne. The wind correction nomograms on the charts are calculated on the basis of 100% wind accountability.

### TAKEOFF WITH ALLOWANCE FOR ENGINE FAILURE

Normal takeoff planning procedure allows for the possibility of an engine failure during takeoff.

## WARNING

If critical field length exceeds the runway available, takeoff will not be attempted at that gross weight.

When runway available is equal to or greater than the critical field length, takeoff data is computed using ground run charts, critical field length charts, refusal speed charts, and the velocity during takeoff ground run chart.

An acceleration check speed, time and/or distance will be determined to validate proper acceleration prior to reaching refusal speed. If an engine fails, or the acceleration check speed is low at the designated acceleration check point, the aircraft is stopped. If an engine fails between the acceleration check speed and refusal speed, the aircraft is also stopped. If an engine fails after reaching refusal speed, the takeoff should be continued. The following steps summarize action to be taken.

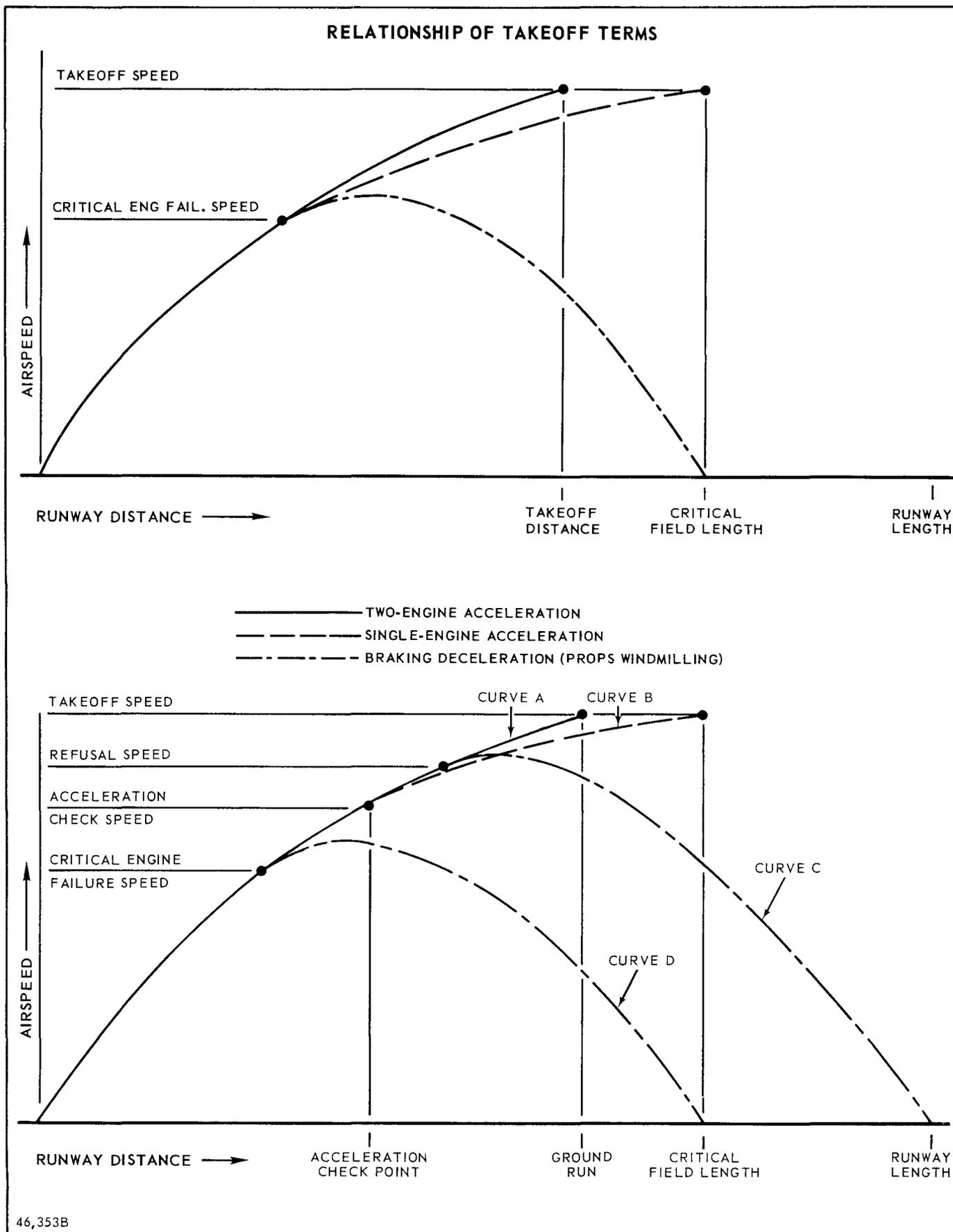


Figure 1A3-1

1. Stop (abort takeoff).
  - a. If an acceleration check speed is not attained by the time the acceleration check speed time and/or distance is reached.
  - b. If engine failure occurs before acceleration check speed is attained.
  - c. If an engine failure occurs between the acceleration check speed and refusal speed.
2. Go (continue takeoff). If an engine failure occurs after reaching refusal speed.

## DISCUSSION OF CHARTS

### TAKEOFF AND LANDING CROSSWIND CHART

A Takeoff and Landing Crosswind Chart (figure 1A3-2) is provided to determine headwind (or tailwind) components and crosswind components for wind speeds up to 60 knots at crosswind angles of 0 to 90 degrees. The minimum liftoff or touchdown speed can also be determined. Enter the chart with maximum gust velocity to determine crosswind and tailwind components, and with maximum steady wind to determine headwind components. If the crosswind component falls in the Caution area, increase the liftoff or touchdown speed as demonstrated in the sample problem.

Use either the gust correction (wind in excess of steady wind velocity) or the increased liftoff or touchdown speed due to crosswind, whichever is greater, but in no case should the correction be greater than 10 knots. Whenever liftoff or touchdown speed is increased for either crosswind or gust correction, the pilot must be prepared to accept a correspondingly longer ground roll. For takeoff, the ground run is corrected on the Velocity during Ground Run Chart (figure 1A3-6) for the increased speed. Refusal speed, distance and time, however, will remain the same. For landing, increased touchdown speed may dictate the selection of an alternate flap setting with a proportionate increase in approach and touchdown speed. Select a flap setting that will give a speed compatible with the minimum touchdown speed after correction for crosswind or gust, and compute the landing ground roll for this flap setting. To compute headwind, tailwind, and crosswind components, a wind angle relative to the takeoff or landing runway must first be determined from the existing surface wind conditions as follows:

1. Subtract the runway heading angle from the magnetic wind direction.
2. If the resultant angle is between 90 and 180 degrees (regardless of sign, + or -), it should be subtracted from 180 to obtain the crosswind angle. If the resultant angle is between 180 and 270 degrees, 180 should be subtracted from the angle. If the resultant angle is between 270 and 360 degrees, it should be subtracted from 360.
3. The Takeoff and Landing Crosswind Chart may then be entered to obtain the headwind, tailwind, and crosswind components.

### EXAMPLE

Given:

Runway heading = 030

Wind direction = 335 degrees

Steady wind velocity = 20 knots

Gust velocity = 28 knots

Find:

Headwind component, crosswind component, and minimum liftoff speed.

1. Determine takeoff speed (from figure 1A3-7) of 103 knots
2. Determine wind angle:  $335 - 30 = 305$   
 $360 - 305 = 55$  degrees
3. Enter chart with wind angle of 55 degrees and read to maximum gust velocity arc of 28 knots
4. Read down to find crosswind component of 23 knots.
5. Read vertically to predicted takeoff speed of 103 knots and determine that takeoff is in the Caution zone.
6. Proceed vertically until the Recommended zone (diagonal line) is reached. Read minimum liftoff speed of 111 knots on the right hand scale.

### Note

- Normally, takeoff will be made using this minimum liftoff speed or the predicted takeoff speed corrected for gusts (103 knots plus gust increment of 8 knots), whichever is greater. In this example, they are the same, 111 knots.
- Do not increase liftoff or touchdown speed more than 10 knots from the predicted speeds.
- 7. Determine headwind component by following wind angle line to steady wind velocity arc of 20 knots and reading to the left for a headwind component of 12 knots. (In the event the wind angle results in a tailwind condition, the tailwind component is determined by reading to the left from maximum gust velocity.)

### TAKEOFF GROSS WEIGHT LIMITED BY CLIMB

These charts (figures 1A3-3 and 1A3-5) present initial climb performance with one engine inoperative and its propeller feathered, and with continuous two-engine operation. Data are shown for approach flap settings as well as their basic takeoff flap settings. Single-engine rate of climb and two-engine rate of climb with landing gear retracted can be determined with any variable of wing flap setting, gross weight, TPSI, altitude, and temperature. The single-engine chart should be used for preflight planning to assure adequate rate of climb if an engine should fail during takeoff.

**EXAMPLE**

Given:

Density altitude = 1800 feet.

Desired rate of climb = 300 fpm.

TPSI = 128 psi.

Gross weight = 44,000 pounds.

To find the takeoff flap setting, enter the chart (figure 1A3-3) at density altitude of 1800 feet (A). Read across to 300 fpm rate of climb (B). Parallel guide lines to the sea level base line and then read up to TPSI, 128 psi (C). Parallel the guide lines to the base line and read up to the takeoff gross weight (D). Read across to find takeoff flap setting of  $0^\circ$  (E).

**Note**

- For practical operations, limit the takeoff flap settings to either  $12^\circ$ ,  $6^\circ$ , or  $0^\circ$ . Intermediate positions should be used only when one of these flap positions will not provide the required rate of climb and runway length combination.
- If the takeoff flap setting should come out as less than  $0^\circ$  under existing conditions, off-load as necessary to reduce the takeoff weight to that which allows the desired rate of climb. If the takeoff weight cannot be reduced, work backwards from the weight and minimum flap setting to determine the rate of climb.

**INITIAL RATE OF CLIMB CORRECTION**

This chart (figure 1A3-4) may be used to determine the initial takeoff rate of climb before the landing gear is retracted. The decrease in rate of climb obtained is due to the landing gear drag at takeoff. When takeoff conditions are critical, the rate of climb correction is applied to the takeoff gross weight limited by climb (figures 1A3-3 and 1A3-5) to re-evaluate the allowable gross weight and/or desired rate of climb.

**WARNING**

This correction applies only during the initial takeoff until the landing gear is retracted. Landing gear retraction after takeoff is a normal requirement and is imperative with one engine inoperative, high temperatures, or high ground elevation. Refer to ENGINE FAILURE, Section III.

**EXAMPLE**

Given:

Gross weight = 44,000 pounds.

Takeoff flap setting =  $0^\circ$ .

Density altitude = 1800 feet.

Desired rate of climb (landing gear up)=300 fpm.

Enter the chart at gross weight of 44,000 pounds (A). Proceed vertically to  $0^\circ$  flap line (B), then across to the base line of density altitude. Parallel the guide lines to density altitude 1800 feet (C), then across to read decrease in rate of climb, -335 feet



(D). This value, when subtracted from 300 fpm rate of climb used in determining gross weight limited by climb, results in a -35 feet rate of climb with the landing gear down. To assure a safe takeoff with one engine inoperative, it will be necessary to re-compute the allowable gross weight. Re-enter the takeoff gross weight limited by climb chart (figure 1A3-3) at desired rate of climb of 335 feet (300 + 35) and with the same conditions of density altitude, torque pressure, and flap setting find the adjusted gross weight of 43,000 pounds.

#### VELOCITY DURING TAKEOFF GROUND RUN

Figure 1A3-6 shows the relationship between distance, time, and speed during the takeoff acceleration. It is based on acceleration from brake release on a dry, hard surface runway with two engines operating. Airspeeds used to enter the chart are indicated airspeeds corrected for 100% of reported headwinds and tailwinds. If actual winds during the takeoff run exceed these values, the time to accelerate to a given checkpoint, and the speed at the checkpoint will be correspondingly higher for headwinds and lower for tailwinds than those computed from the chart. The refusal speed distance, acceleration check speed and checkpoint may be determined from this chart. To do this, it is necessary first to obtain the ground run for the flap setting used (figures 1A3-10, 1A3-13, 1A3-16, or 1A3-19) and indicated takeoff speed (figure 1A3-7). The ground run should be corrected for wind and runway slope. By entering the chart with takeoff speed and takeoff ground run corrected for wind, a contour line is established which is then used to determine the acceleration check speed, time, and distance. From the applicable refusal speed chart (figures 1A3-9, 1A3-12, 1A3-15, or 1A3-18), determine the indicated refusal speed corrected for wind for the available runway and again correct for wind before entering the chart. Following the corrected refusal speed to the contour line previously established will determine the refusal distance. Acceleration speed/time is then determined at the intersection of the contour line and the acceleration checkpoint time/distance. This speed is then corrected for wind velocity. Distance, speed, and time relationships for other speeds can also be determined.

The acceleration time check is the most accurate means of checking acceleration. With this method, an even 10 knot increment, not less than 5 and not more than 15 knots below refusal speed, will normally be used as an acceleration check speed. As a secondary procedure, on marked runways the acceleration check may be made at a distance marker. For this method, the acceleration checkpoint will normally be the first 1000 foot marker at least 500 feet but not more than 1500 feet prior to the refusal distance.

#### EXAMPLE

Given:

Wind (100% of reported headwind) = 10 knots.

Ground run (corrected for headwind and slope) = 3600 feet.

Takeoff speed = 119 knots IAS.

Refusal speed (corrected for headwind) = 115 knots IAS.

Density altitude = 5600 feet.

Subtract headwind from takeoff speed to obtain corrected takeoff speed (119 - 10 = 109 knots IAS). Enter chart (figure 1A3-6) with corrected takeoff speed of 109 knots IAS (A) and read up to ground run of 3600 feet (B) and establish a contour line by following the guide lines.

Subtract headwind from the refusal speed to obtain the corrected refusal speed (115 - 10 = 105 knots IAS). Enter the chart with corrected refusal speed of 105 knots IAS (C) and read up to the intersection of contour line (D) to find the refusal distance of 3250 feet.

Enter the chart at the nearest 1000 foot marker at least 500 feet below the refusal distance to determine acceleration check distance of 2000 feet (E). Read across to the intersection of the contour line to find time to accelerate of 29 seconds (F), and read down to find uncorrected acceleration check speed of 88 knots IAS (G).

Correct acceleration check speed by adding headwind velocity (88 + 10 = 98 knots IAS).

Determine  $1/\sqrt{\sigma}$  of 1.087 from the Density Altitude vs  $1/\sqrt{\sigma}$  chart (figure 1A1-2) for 5600 feet density altitude. Correct time to accelerate by dividing by this figure. Actual time at the marker will be  $29 \div 1.087 = 27$  seconds.

#### Note

Since the contour (acceleration) line has been established for the given conditions, time to any speed or distance can be readily determined.

#### TAKEOFF AND MINIMUM CONTROL SPEEDS

The Takeoff and Minimum Control Speed Chart (figure 1A3-7) is provided to show takeoff speeds and 1.1 minimum control speeds. Takeoff speed is based on 120 percent of power-off stall speed or 110 percent of minimum control speed, whichever is greater. At low gross weights and larger flap settings, the minimum control speed becomes greater than the takeoff speed.

#### EXAMPLE

Given:

Gross weight = 42,000 pounds.

Flap setting = 12°.

Find takeoff speed by entering chart at gross weight of 42,000 pounds (A), and reading up to flap deflection of  $12^\circ$  (B). Read across to find speed of 114 knots (C).

### CRITICAL FIELD LENGTH

The critical field length is defined as the total length of runway required to accelerate on both engines to the critical engine failure speed, lose one engine, and then continue takeoff, or stop. Critical engine failure speed is determined by entering the refusal speed chart using critical field length for the runway length and computing speed in the same manner as for refusal speed.

The stopping distance portion of the critical field length has been determined by the use of brakes only. This data also includes a three second reaction time/distance after reaching critical engine failure speed before the remaining engine is cut and brakes are applied. To determine critical field length, refer to figures 1A3-8, 1A3-11, 1A3-14, and 1A3-17.

#### EXAMPLE

Given:

Density altitude = 1800 feet.

TPSI = 126 psi.

Gross weight = 44,000 pounds.

Runway slope = 1 percent up.

Reported headwind = 10 knots.

Flap setting =  $12^\circ$ .

Select chart for  $12^\circ$  flap (figure 1A3-11). Enter chart at density altitude 1800 feet (A). Read up guide line to the 126 TPSI line (B). Read across to 44,000 pounds gross weight (C), and then down into the runway slope chart and follow the uphill curve to one percent (D). Read down and into the wind velocity chart. Follow the headwind curve to 10 knots (E), and read down to find the critical field length of 4300 feet (F). For the conditions given above, critical field length, uncorrected for wind, would be 4800 feet. Applying correction for headwind, corrected critical field length would be 4300 feet (F).

### REFUSAL SPEED

The Refusal Speed Charts (figures 1A3-9, 1A3-12, 1A3-15, and 1A3-18) provide a means of determining the refusal speed for various conditions of gross weight, density altitude, TPSI, and wind. Refusal speed is the maximum speed at which takeoff may be aborted and the airplane brought to a complete stop within the remaining runway length, using brakes only. If the critical field length and runway available are the same, then refusal speed and critical engine failure speed are identical. If, however, the runway length is greater than critical field length, then the refusal speed may be considerably higher than the critical engine failure speed. For this reason, the refusal speed is of primary

importance during takeoff operation. It must be remembered that the validity of the refusal speed is dependent on a normal two engine acceleration of the aircraft. If the acceleration is low, the aircraft will have used more runway than predicted in reaching the refusal speed, and insufficient runway will remain in which to stop the airplane. For this reason, use of acceleration check speed, time and/or distance is necessary to insure safe takeoff. When corrected refusal speed exceeds takeoff speed, use takeoff speed as refusal speed.

#### EXAMPLE

Given:

Density altitude = 1800 feet.

TPSI = 126 psi.

Gross weight = 44,000 pounds.

Runway length = 5000 feet.

Reported headwind = 10 knots.

Flap setting =  $12^\circ$ .

Select chart for  $12^\circ$  flap (figure 1A3-12). Enter chart at runway length 5000 feet (A) and read across to reported headwind 10 knots (B). Follow guide line to base line and read across to 126 TPSI (C). Follow guide line to base line and read across to 1800 feet density altitude (D). Follow guide line to base line and read across to intersection of gross weight line from 44,000 pounds (D). Read refusal speed 109 knots IAS (F).

### TAKEOFF GROUND RUN

Charts (figures 1A3-10, 1A3-13, 1A3-16, and 1A3-19) are provided to determine the ground run distance required from brake release to the point of takeoff for various conditions of gross weight, density altitude, wind, and TPSI for each takeoff flap setting. Under certain conditions where runway length is not critical but obstacle clearance is, takeoff with zero degrees flap may be utilized.

#### EXAMPLE

Given:

Density altitude = 1800 feet

TPSI = 126 psi.

Gross weight = 44,000 pounds.

Runway slope = 1 percent up.

Reported headwind = 10 knots.

Flap setting =  $12^\circ$ .

Select chart for  $12^\circ$  flap (figure 1A3-13). Enter chart at density altitude 1800 feet (A). Read up guide line to the 126 TPSI line (B). Read across to 44,000 pounds gross weight (C), and then down into the runway slope chart and follow the uphill curve to 1 per-

cent (D). Read down and into the wind velocity chart. Follow the headwind curve to 10 knots (E), and read down to find corrected ground run of 2900 feet (F).

**RUNWAY CONDITION READING (RCR)**

Stopping distance depends upon tire-to-runway coefficient of friction, which varies with condition of the runway surface. Runway surface condition will be reported as a Runway Condition Reading (RCR). The RCR is a measure of the coefficient of friction between the tire and the runway surface, as determined by an inspection decelerometer. All charts involving stopping distance are based on dry concrete or asphalt friction coefficients corresponding to an RCR of 23. Slippery runway surfaces will increase stopping distances; increased distances are accounted for by correction charts as a function of RCR. RCR is reported in two-digit numbers between 02 and 26. Many airfields will continue to report braking action in accordance with ICAO documents. This is the GOOD, MEDIUM, and POOR classification of braking action on unusual runway surface condition. In order to relate their classifications to an RCR, or when RCR values are not available, the following relationship will be used:

<u>RUNWAY CONDITION</u>	<u>ICAO REPORT</u>	<u>RCR</u>
Dry	Good	23
Wet	Medium	12
Icy	Poor	05

**EXAMPLE**

Given:

Gross weight = 40,000 pounds.

Critical field length = 4300 feet.

Refusal speed = 109 KIAS.

Runway condition = Icy.

Enter chart (figure 1A3-20) with a Runway Condition Reading (RCR) of 5 (obtained from base weather) for an icy runway (A). Read across to gross weight in refusal speed portion of chart (B) and read down to find refusal speed correction factor  $K_{RS}$  0.81 (C). Multiply refusal speed by  $K_{RS}$  factor to obtain refusal speed for runway condition. Follow same procedure to correct critical field length using the  $K_{CFL}$  factor.

**RUNWAY SURFACE COVERING (RSC)**

Also reported will be Runway Surface Covering (RSC), which will be the average runway surface covering given in depth and type, such as slush, water, or snow. The depth of this covering can cause a significant reduction in takeoff performance due to the retarding effect of the tires displacing the covering, plus the additional drag effect of this material being sprayed and consequently striking the aircraft surfaces. The retarding effect of slush and water puddles increases as the speed increases.

However, the retarding effect will vary considerably with varying slush and water depths encountered on the runway due to surface contour. The retarding effect of slush and water puddles will decrease when the aircraft reaches hydroplaning speed. Hydroplaning occurs because the pressure between the fluid on the runway and the tires increases until the tires are entirely supported on top of the fluid. The speed at which this occurs is called hydroplaning speed and is usually lower than end acceleration check speed. Due to the number of unpredictable conditions which affect acceleration with various types of runway covering, the acceleration check will not be an accurate indication of performance when takeoff is attempted in a measurable depth of slush, snow, or water.

**CAUTION**

As there are no corrections given for RSC, the pilot should exercise extreme caution during takeoff planning and ground run on water, slush, or snow covered runways.

**CLIMBOUT FACTOR FOR CLIMBOUT FLIGHT PATH**

Figures 1A3-21 and 1A3-31 will provide climbout factors for use with the climbout flight path charts. Figure 1A3-21 should be used to determine the climbout factor for use with the takeoff power (2800 rpm) climbout flight path charts, and figure 1A3-31 should be used to determine the climbout factor for use with the METO power climbout flight path chart. The climbout factor chart for takeoff power has engine power correction lines in terms of torque pressure. However, power corrections in the climbout factor chart for METO power is in terms of bhp, thus making it possible to use the chart for a range of engine rpm.

**WARNING**

The METO power climbout factor chart was constructed for use with engine rpm's from 2500 to 2700. The charts become excessively inaccurate at rpm's outside this range.

**EXAMPLE (for takeoff power settings)**

Given:

Gross weight = 44,000 pounds.

Density altitude = 1800 feet.

TPSI = 126 psi.

Enter the climbout factor chart (figure 1A3-21) at gross weight of 44,000 pounds (A) and read up to density altitude of 1800 feet (B). Read across to 126 psi in the torque pressure curves (C) and then down to find the climbout factor of 6 (D). This factor can be used in any of the takeoff power (2800 rpm) climbout flight path charts, figures 1A3-22 through 1A3-30.

A climbout factor for use in the METO power climbout flight path chart can be determined in the same manner by using figure 1A3-31. In this case, the bhp for the corresponding pressure altitude must first be obtained from the METO power climb schedule and then applied at the appropriate spot in the climbout factor chart.

**WARNING**

The climbout factors obtained for takeoff power and the factors for METO power are not interchangeable. Do not use a takeoff power climbout factor on the METO power flight path chart or vice versa.

**CLIMBOUT FLIGHT PATH**

Climbout flight path charts, figures 1A3-22 through 1A3-30, and 1A3-32 are provided to determine the distance required to clear a given obstacle. Figures 1A3-22 through 1A3-26 and 1A3-28 through 1A3-30 provide all the information needed to determine obstacle clearance capability within the first 11,000 feet horizontal distance or 600 feet altitude after takeoff. Figures 1A3-27 and 1A3-32 are needed to determine extended flight path information beyond 11,000 feet horizontal distance or 600 feet vertical altitude. In this case, the vertical and horizontal distances must be determined in increments, then the increments, or segments, must be added together to complete the climbout flight path analysis.

Individual charts provide data for two-engine or one-engine operation and for takeoff flap settings of 0, 6, 12, or 24 degrees. All climbout flight path charts are based on a speed of 1.2 stall speed for the particular flap setting.

**WARNING**

The climbout factor to be applied must be obtained from the appropriate climbout factor chart depending on the flight path chart to be used.

**EXAMPLE**

Given:

Obstacle Height = 6900 feet.

Obstacle distance = 105,000 feet (from brake release).

Takeoff gross weight = 44,000 pounds.

Engines Operating = 2.

Torque pressure = 126 psi.

Takeoff flap setting = 6°.

Takeoff ground run = 3675.

Flap retraction altitude = 500 feet.

Takeoff density altitude = 1800 feet.

OAT = 15°C.

Reported headwind = 10 knots.

Determine initial climbout factor of 6 from figure 1A3-21 for takeoff weight, density altitude, and torque pressure. Enter climbout flight path chart for two-engine, 6° flap operation (figure 1A3-23).

Follow factor line 6 to 500 feet altitude, apply correction for reported headwind and record distance of 4700 feet.

At this point, 500 feet, we will assume that IAS is increased to 1.2 stall speed for 0° flaps, flaps are retracted to 0°, and power is reduced to METO.

**Note**

The flap retraction, power reduction point is not dictated by any specific requirement. It may be a function of operating policy, immediate obstacle clearance requirement, or simply pilot preference.

Convert density altitude (1800 + 500 = 2300) to pressure altitude (approximately 1900 feet) and determine bhp (1800) from the METO power climb schedule (figure 1A2-8). Note that 1800 bhp can be held for approximately 6100 feet of climb (from 1900 feet pressure altitude) and then METO power drops to 1600 bhp for the next 4000 feet.

Enter METO power climbout factor chart (figure 1A3-31) with 44,000 pounds (ignore fuel usage), 2300 feet density altitude, and 1800 bhp to obtain climbout factor of 6.6. Also obtain factor of 8.1 for 8400 feet and 1600 bhp.

Enter METO power climbout flight path chart (figure 1A3-32) and follow estimated 6.6 climbout factor line to 6100 feet, apply correction for reported headwind (10 knots), and record distance of 62,500 feet.

**Note**

If winds aloft are available, use their reported value rather than using field elevation winds for making distance corrections.

At this point, compute the remaining distance to obstacle. 105,000 feet (total distance) - 3675 feet (takeoff run) - 4700 feet (initial climb segment) - 62,500 feet (extended climb segment) = 34,125 feet remaining.

Enter METO power climbout flight path chart (figure 1A3-32) with remaining distance (34,125 feet), remove correction for reported headwind

(giving a distance of 37,500 feet), and move vertically to intersect the 8.1 factor line. Read altitude of 2250 feet.

Add this altitude to previous altitude segments (500 + 6100 + 2250 = 8850 feet). Since this altitude is greater than the obstacle height, the obstacle can be cleared.

### MAXIMUM EFFORT

For maximum effort planning, the two-engine takeoff gross weight limited by climb, takeoff ground run, and METO power climb charts are used. These data represent maximum possible airplane performance regardless of the risks involved. The takeoff ground run and respective operational gross weights are predicated on the continued operation of both engines. When planning a takeoff using this information, consider the use of the lowest of the flap settings first.

### Note

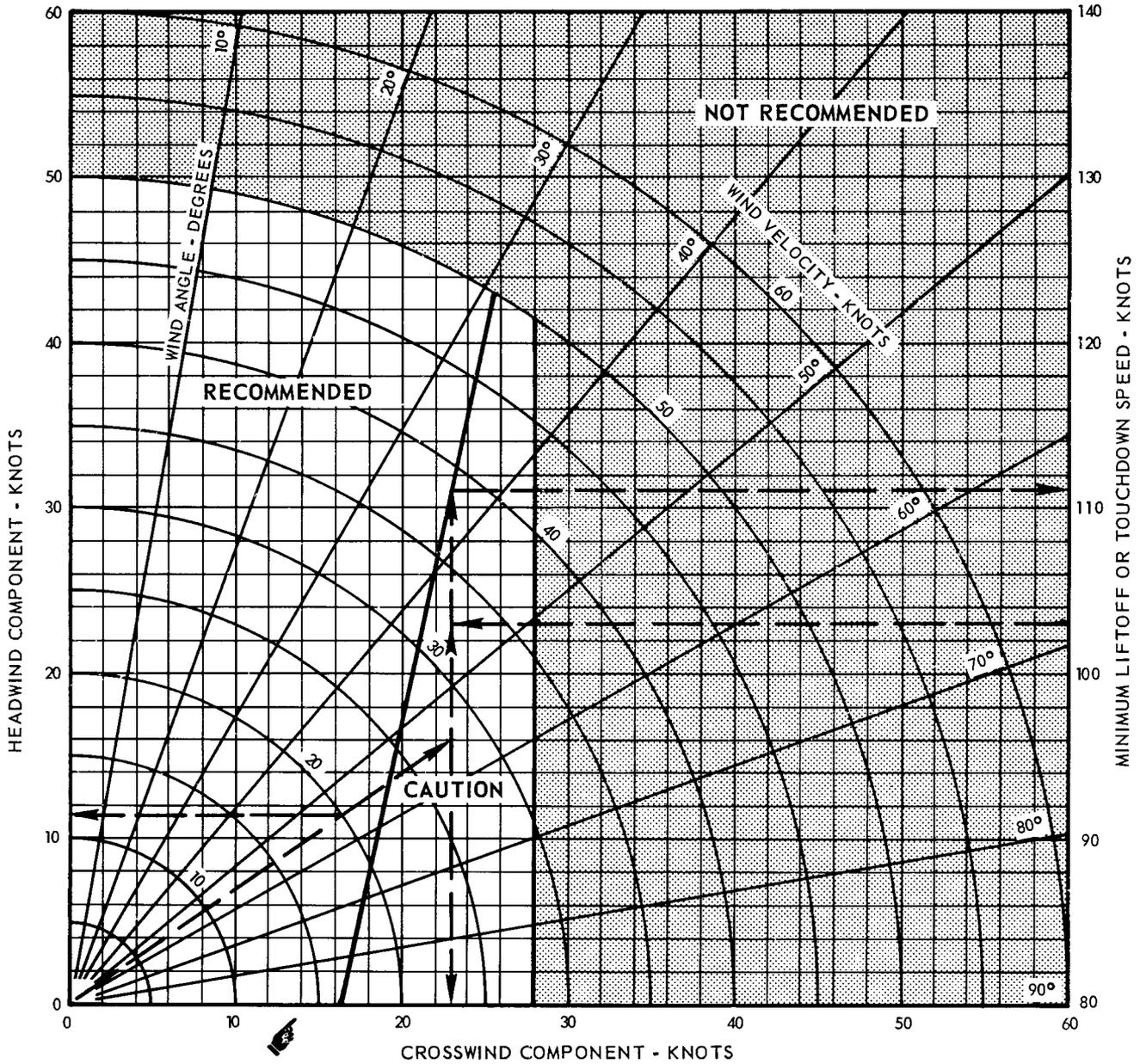
This procedure is the reverse of normal flight planning in which the highest flap setting is considered first. In maximum effort planning it is desirable to obtain the best performance (even though it is substandard) within the runway length available.

This setting will be acceptable if the takeoff ground run distance found on the chart is equal to or less than the length of the runway under consideration. If the required runway length is greater than the distance available, a greater wing flap setting will have to be considered. If, after checking all takeoff flap settings, the available takeoff runway is still too short, the gross weight will have to be reduced in order to operate from the field. A takeoff distance obtained from these charts is the distance from release of brakes to takeoff. In addition, each of the takeoff ground run charts has a correction factor that can be used to determine the distance required to clear a 50-foot obstacle.

MODEL: T-29 A/B  
DATE: 7 DECEMBER 1971  
DATA BASIS: ESTIMATED

TAKEOFF AND LANDING CROSSWIND CHART

ENGINES: R2800-97



NOTES:

1. ENTER CHART WITH MAXIMUM GUST VELOCITY TO DETERMINE CROSSWIND OR TAILWIND COMPONENT.
2. ENTER CHART WITH MAXIMUM STEADY WIND VELOCITY TO DETERMINE HEADWIND COMPONENT.
3. IF TAKEOFF IS MADE IN THE CAUTION ZONE, A SLIGHT YAW MAY BE EXPECTED BETWEEN ROTATION AND LIFTOFF.

THE TAKEOFF AND LANDING CROSSWIND COMPONENT IS BASED ON IDEAL RUNWAY CONDITIONS. WHEN RUNWAY CONDITIONS ARE OTHER THAN IDEAL, THE RCR SHOULD BE CONSIDERED. THE CROSSWIND COMPONENT FIGURES LISTED HERE ARE SUGGESTED VALUES TO BE USED WITH THE INDICATED RCR'S.

RCR	2	3	4	5	6	7	8	9	10	11	12
CROSSWIND COMP.	0	2	5	7	10	12	15	17	20	22	28

24, 188C

Figure 1A3-2

MODEL: T-29 A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST

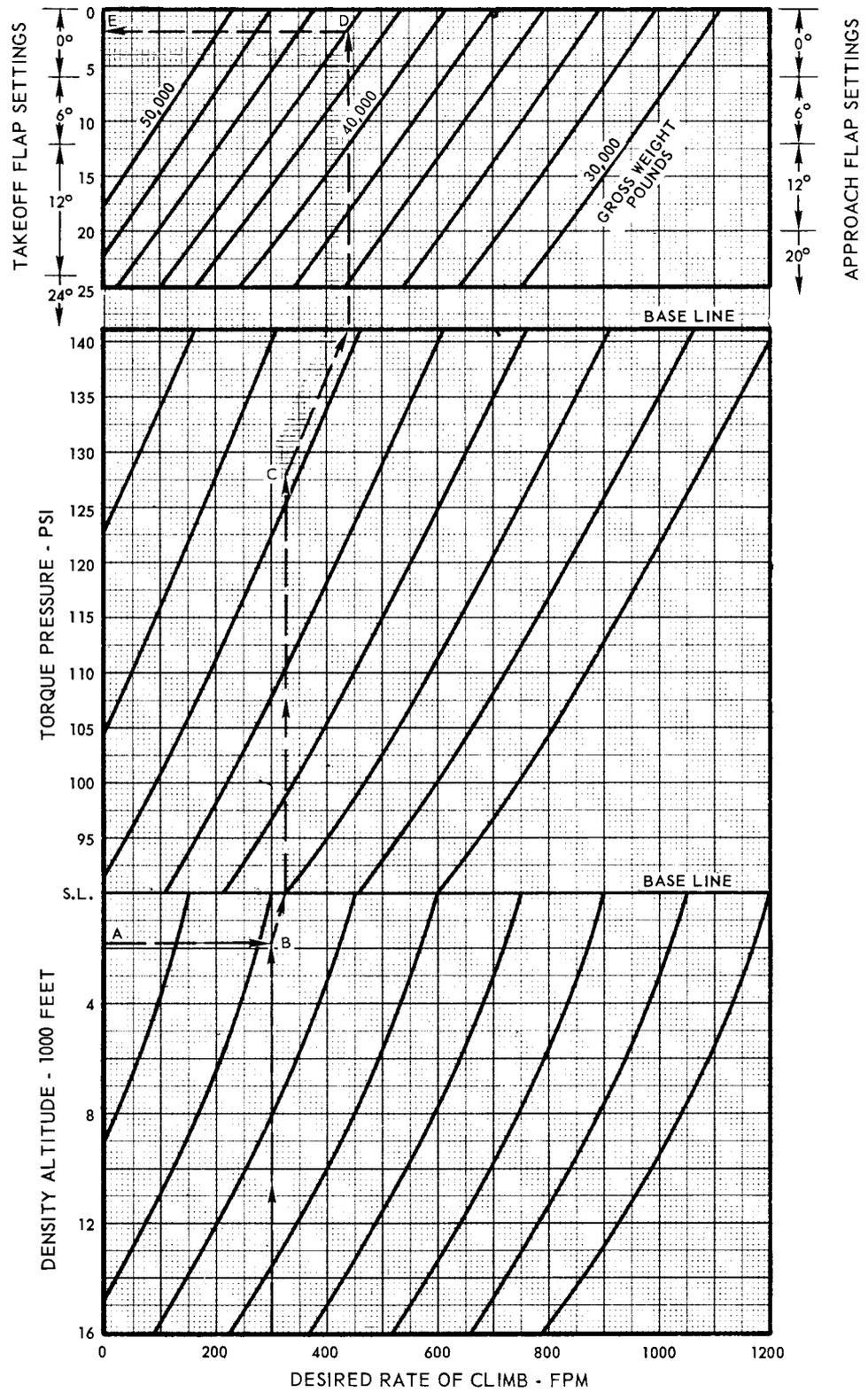
### TAKEOFF GROSS WEIGHT LIMITED BY CLIMB

IF ONE ENGINE FAILS DURING TAKEOFF  
LANDING GEAR UP 2800 RPM

ENGINES: R2800-97

#### REMARKS:

- (1) INOPERATIVE PROPELLER FEATHERED
- (2) LANDING GEAR RETRACTED
- (3) NACELLE FLAPS OPEN TO MID-POSITION
- (4) CLIMB SPEED - TAKEOFF SPEED (REFER TO TAKEOFF CURVES)



45,971E

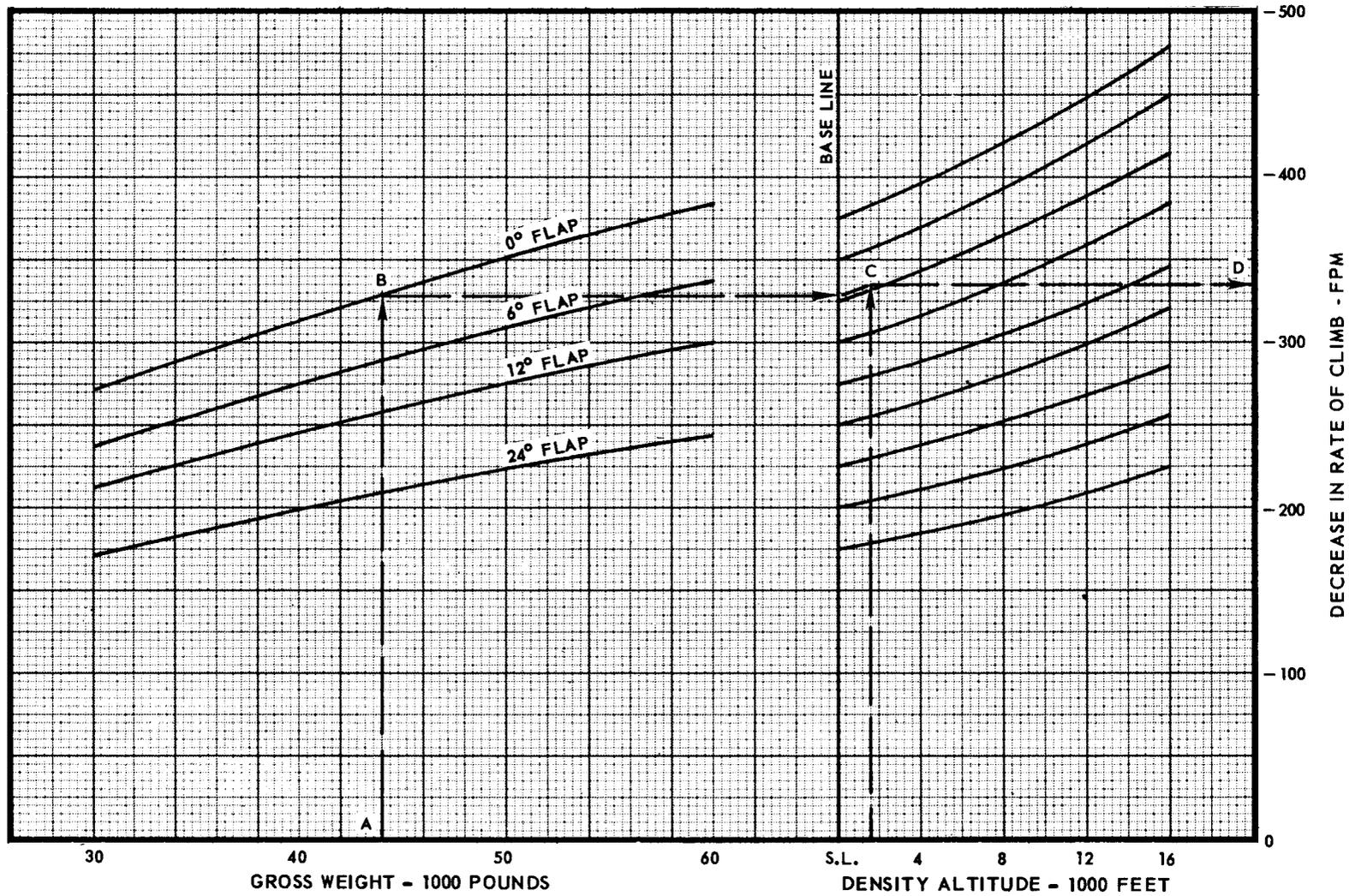
Figure 1A3-3

MODEL: T-29 A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST

INITIAL RATE OF CLIMB CORRECTION

LANDING GEAR DOWN 2800 RPM

ENGINES: R2800-97



**NOTE:**

THE DECREASE IN RATE OF CLIMB IS DUE TO LANDING GEAR DRAG AT TAKEOFF.  
THE CORRECTION IS APPLICABLE TO THE RATE OF CLIMB FROM THE GROSS WEIGHT  
LIMITED BY CLIMB CHARTS, SINGLE ENGINE AND TWO ENGINE.

Figure IA3-4

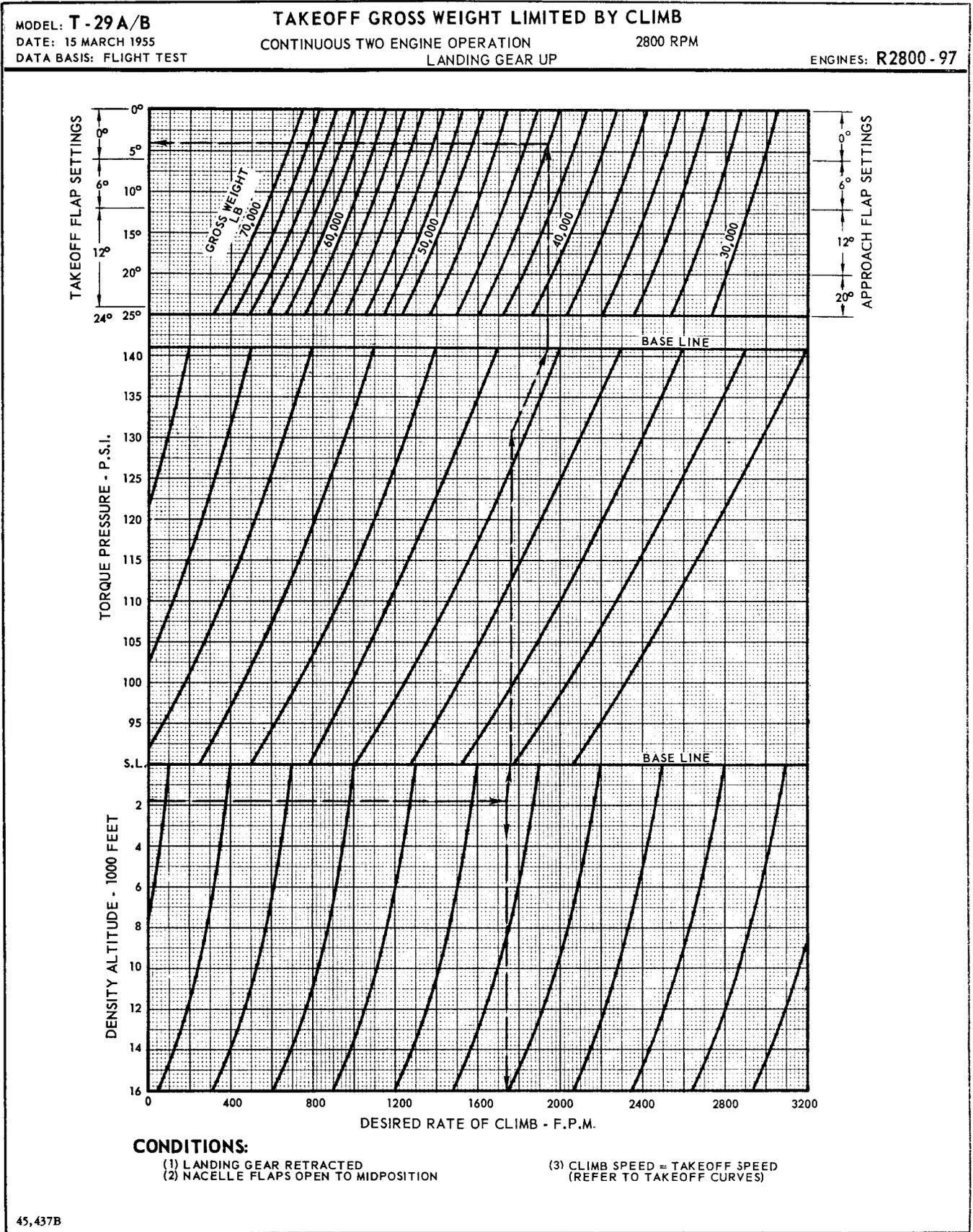
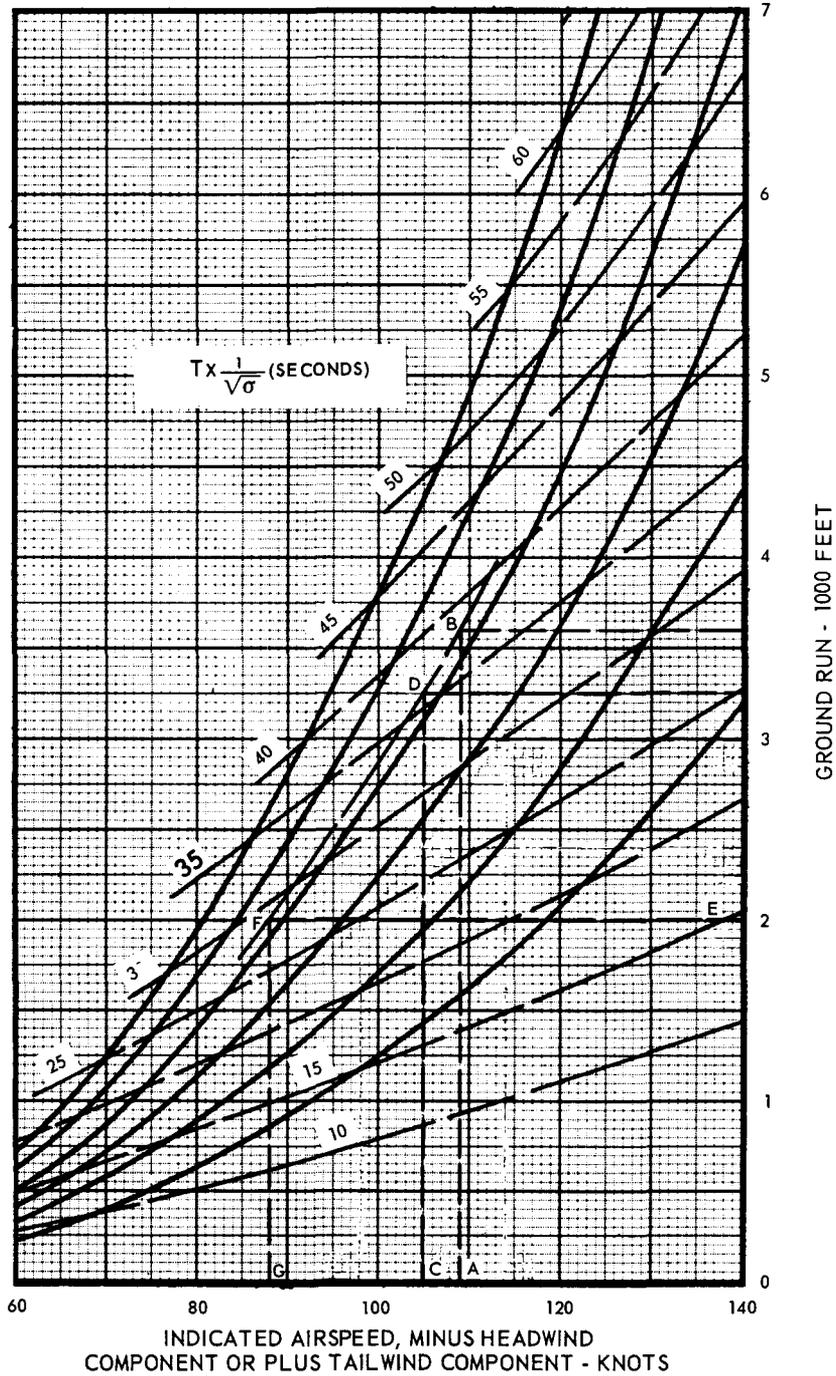


Figure 1A3-5

MODEL: T-29 A/B  
DATE: 15 MARCH 1955  
DATA BASIS: **FLIGHT TEST**

**VELOCITY DURING TAKEOFF GROUND RUN**  
(FOR ALL WEIGHTS AND FLAP SETTINGS)  
2800 RPM

ENGINES: R2800-97



**NOTES:**

1. 100% WIND ACCOUNTABILITY.
2. TIME LINES ARE FOR SEA LEVEL. STANDARD CONDITIONS. TO OBTAIN TRUE TIME AT DENSITY ALTITUDE, DIVIDE  $TX \frac{1}{\sqrt{\sigma}}$  BY  $\frac{1}{\sqrt{\sigma}}$ .

45,456 A

Figure 1A3-6

MODEL: T-29A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

TAKEOFF AND MINIMUM CONTROL SPEEDS  
 LANDING GEAR RETRACTED

ENGINES: R2800-97

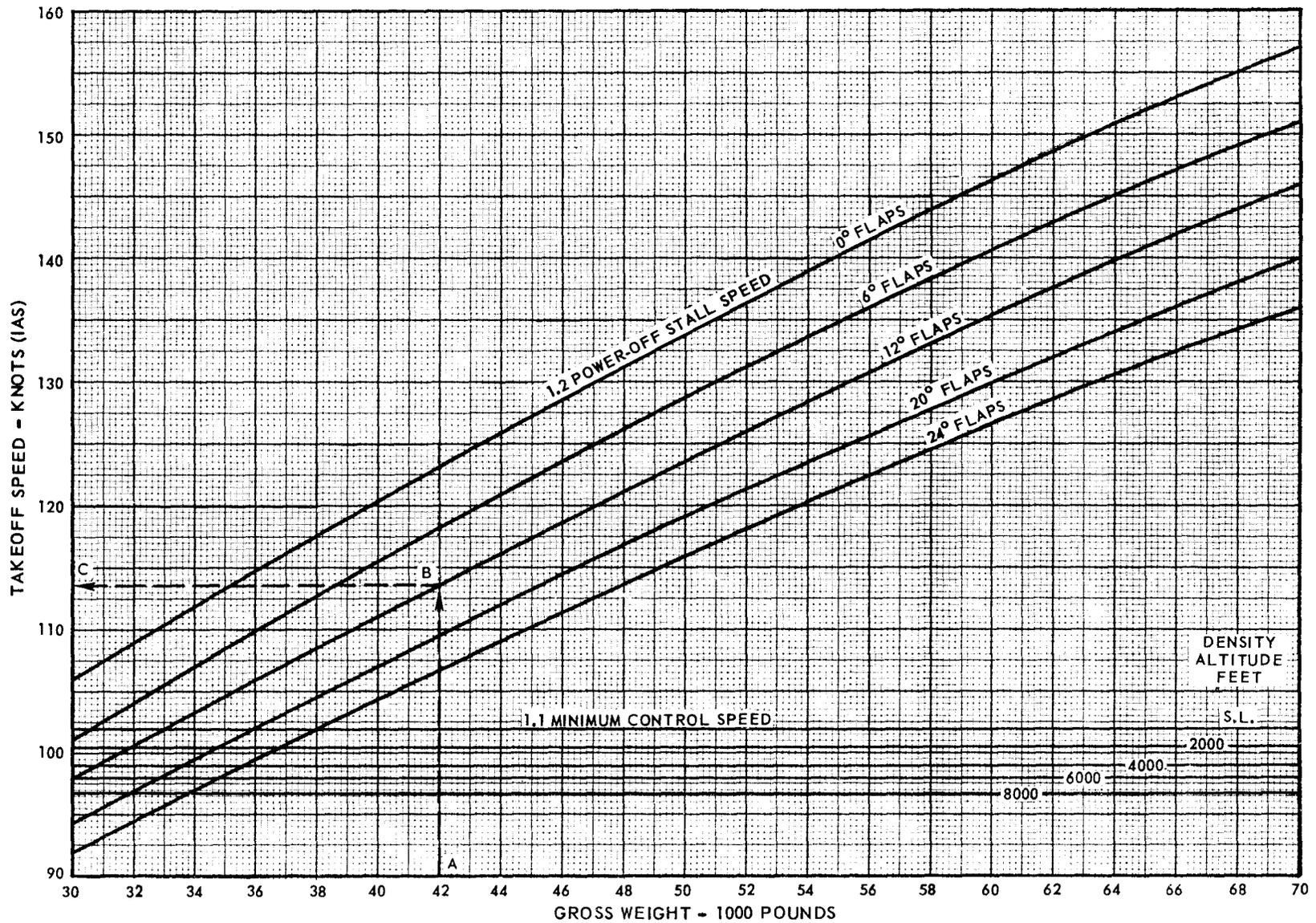


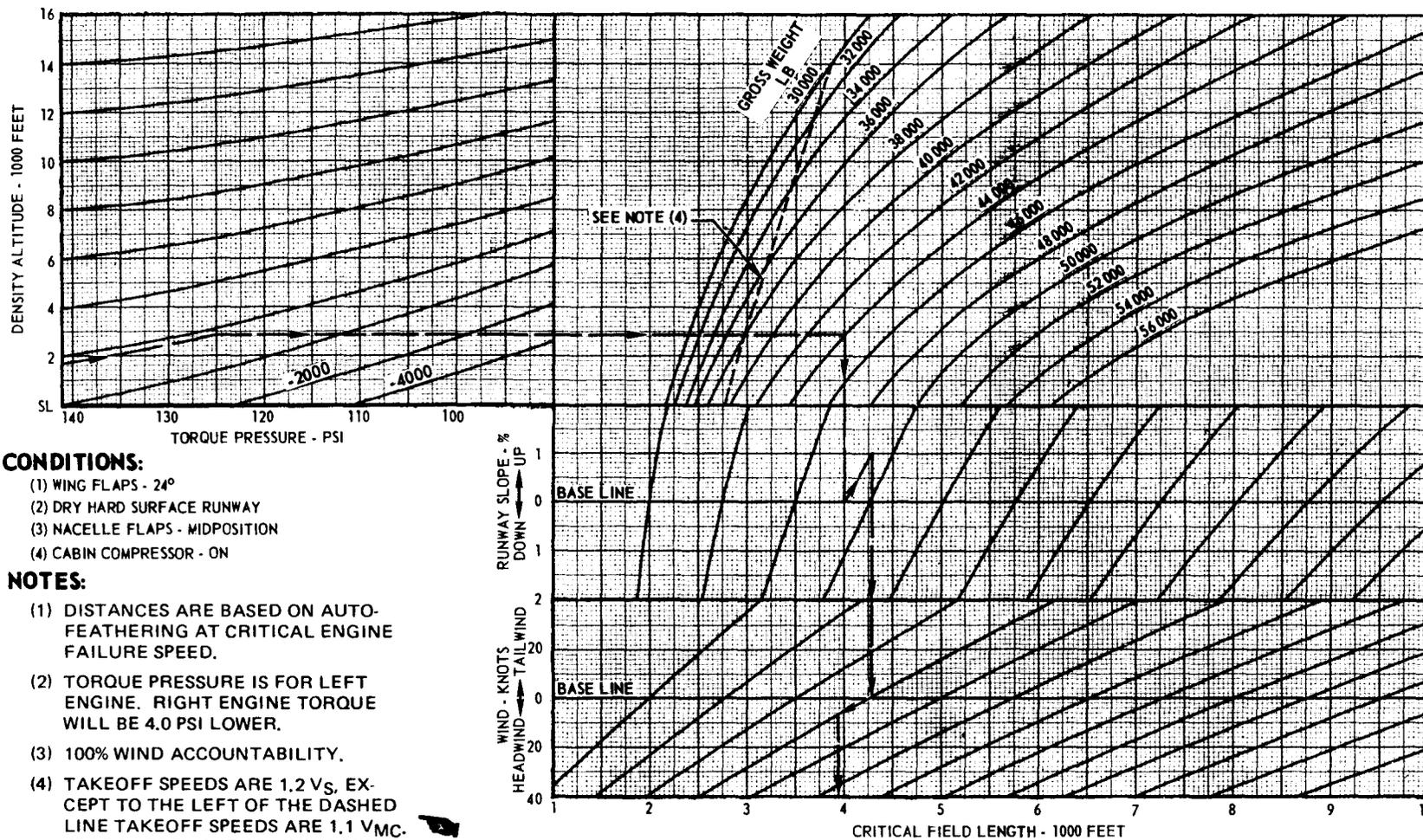
Figure IA3-7

# CRITICAL FIELD LENGTH (24° FLAP)

MODEL: **T-29A/B**  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

2800 RPM

ENGINES: **R 2800-97**



**CONDITIONS:**

- (1) WING FLAPS - 24°
- (2) DRY HARD SURFACE RUNWAY
- (3) NACELLE FLAPS - MIDPOSITION
- (4) CABIN COMPRESSOR - ON

**NOTES:**

- (1) DISTANCES ARE BASED ON AUTO-FEATHERING AT CRITICAL ENGINE FAILURE SPEED.
- (2) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE WILL BE 4.0 PSI LOWER.
- (3) 100% WIND ACCOUNTABILITY.
- (4) TAKEOFF SPEEDS ARE 1.2 V<sub>S</sub>, EXCEPT TO THE LEFT OF THE DASHED LINE TAKEOFF SPEEDS ARE 1.1 V<sub>MC</sub>. SEE TAKEOFF AND MINIMUM CONTROL SPEEDS CHART.

45,439D

IA3-16

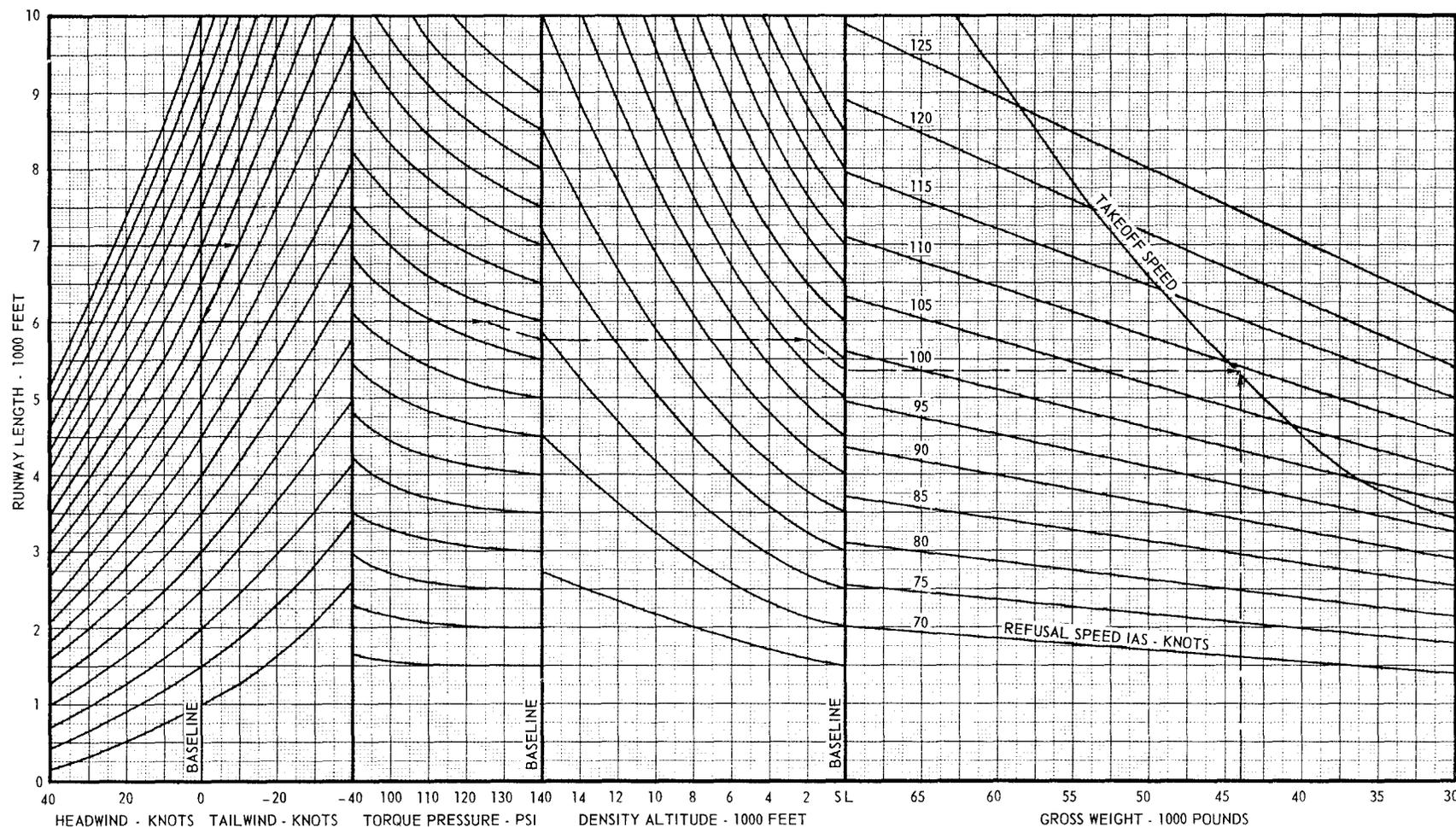
Change 3

Figure IA3-8

MODEL: T29A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

### REFUSAL SPEED (24° FLAP)

ENGINES: R2800 - 97



**CONDITIONS:**

- (1) WING FLAPS AT 24°
- (2) DRY HARD SURFACE RUNWAY
- (3) NACELLE FLAPS MIDPOSITION
- (4) CABIN COMPRESSOR ON

**NOTES:**

- (1) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE PRESSURE WILL BE 4.0 PSI LOWER.
- (2) 100% WIND ACCOUNTABILITY
- (3) BASED ON PILOT REACTION TIME 6 SECONDS.

45,438D

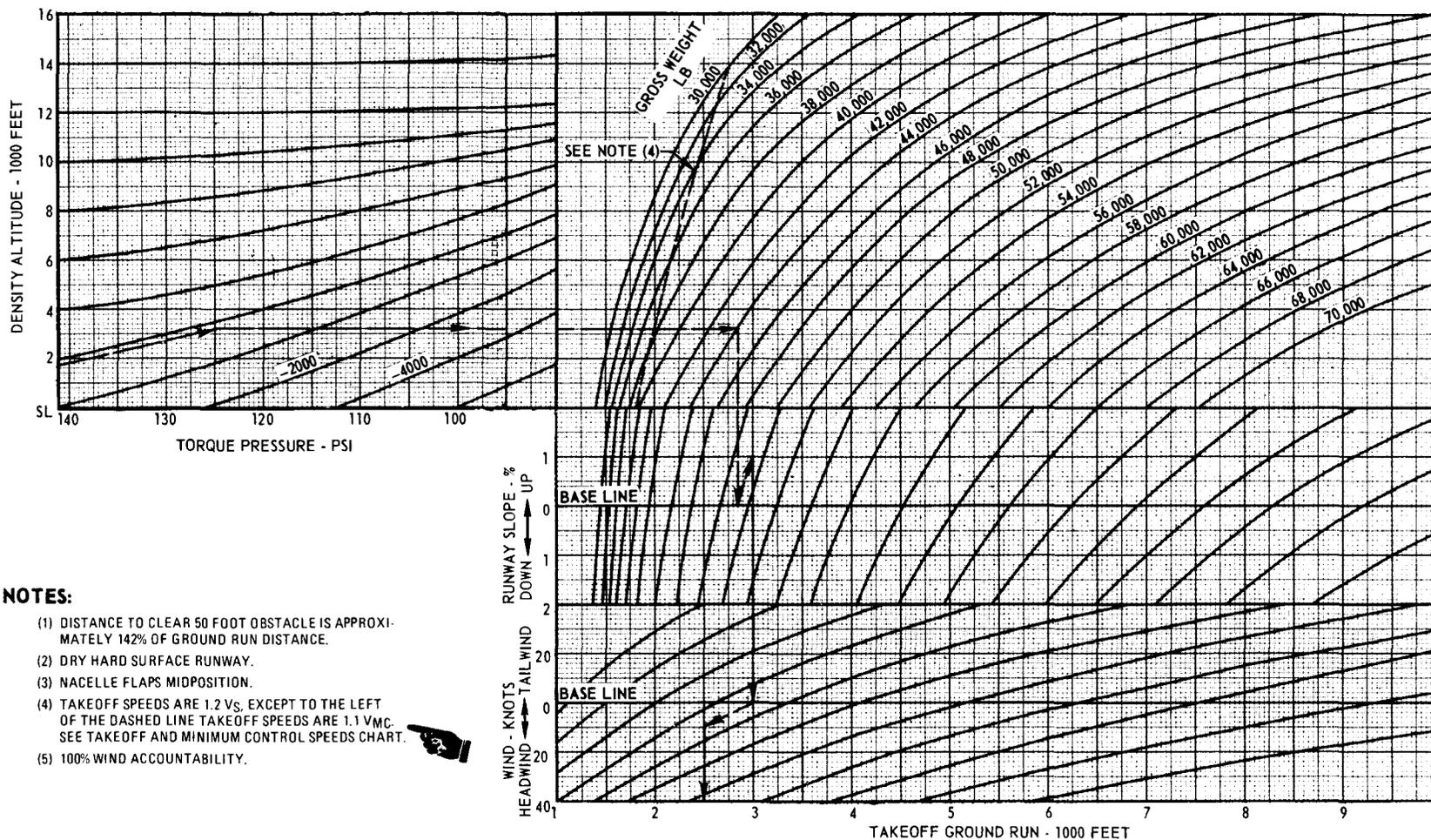
Figure IA3-9

# TAKEOFF GROUND RUN (24° FLAP)

CONTINUOUS TWO ENGINE OPERATION  
2800 RPM

ENGINES: R2800-97

MODEL: T-29A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST



**NOTES:**

- (1) DISTANCE TO CLEAR 50 FOOT OBSTACLE IS APPROXIMATELY 142% OF GROUND RUN DISTANCE.
- (2) DRY HARD SURFACE RUNWAY.
- (3) NACELLE FLAPS MIDPOSITION.
- (4) TAKEOFF SPEEDS ARE 1.2 V<sub>S</sub>, EXCEPT TO THE LEFT OF THE DASHED LINE TAKEOFF SPEEDS ARE 1.1 V<sub>MC</sub>. SEE TAKEOFF AND MINIMUM CONTROL SPEEDS CHART.
- (5) 100% WIND ACCOUNTABILITY.



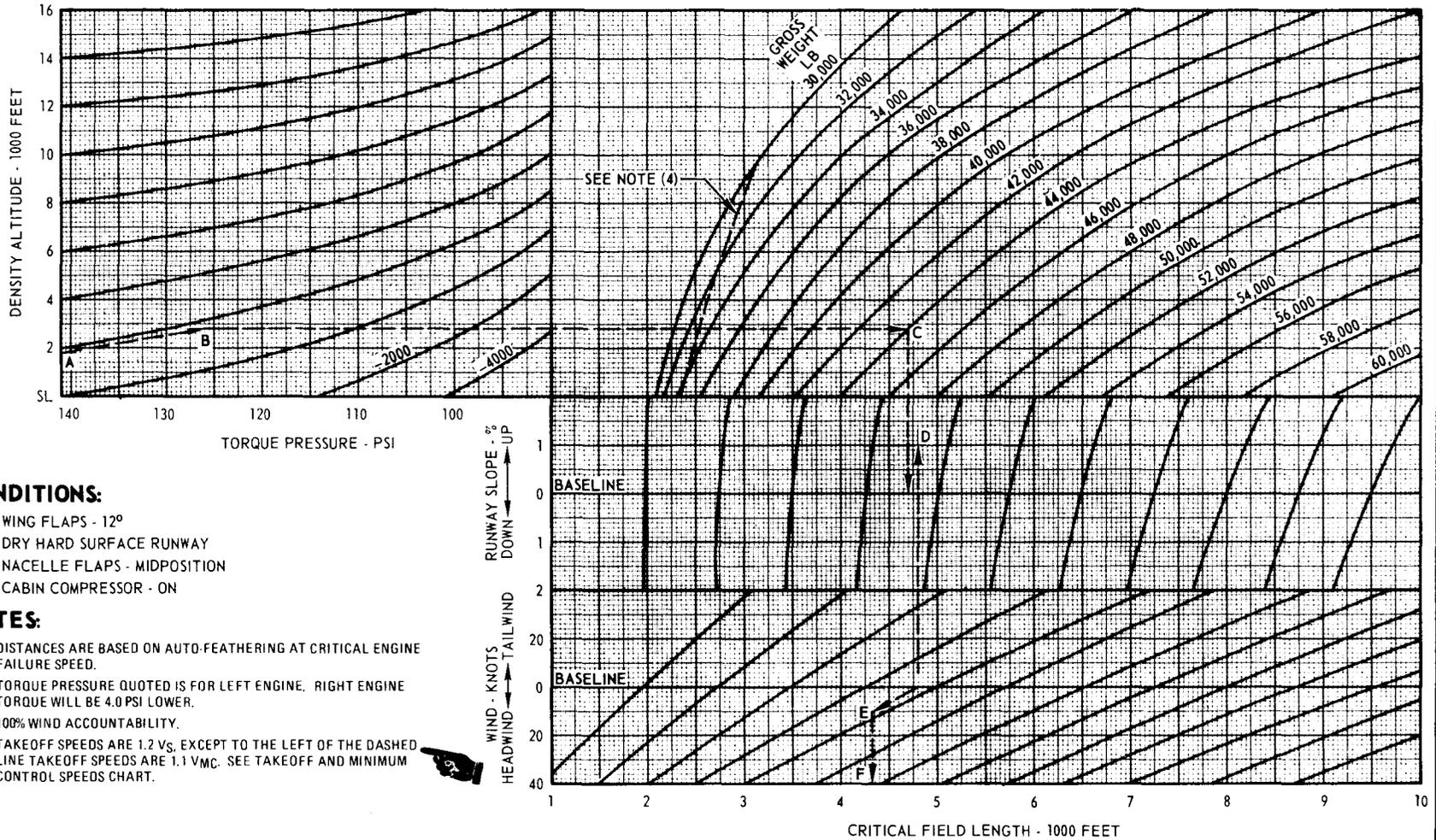
45,440D

# CRITICAL FIELD LENGTH (12° FLAP)

MODEL: T-29A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

2800 RPM

ENGINES: R2800-97



### CONDITIONS:

- (1) WING FLAPS - 12°
- (2) DRY HARD SURFACE RUNWAY
- (3) NACELLE FLAPS - MIDPOSITION
- (4) CABIN COMPRESSOR - ON

### NOTES:

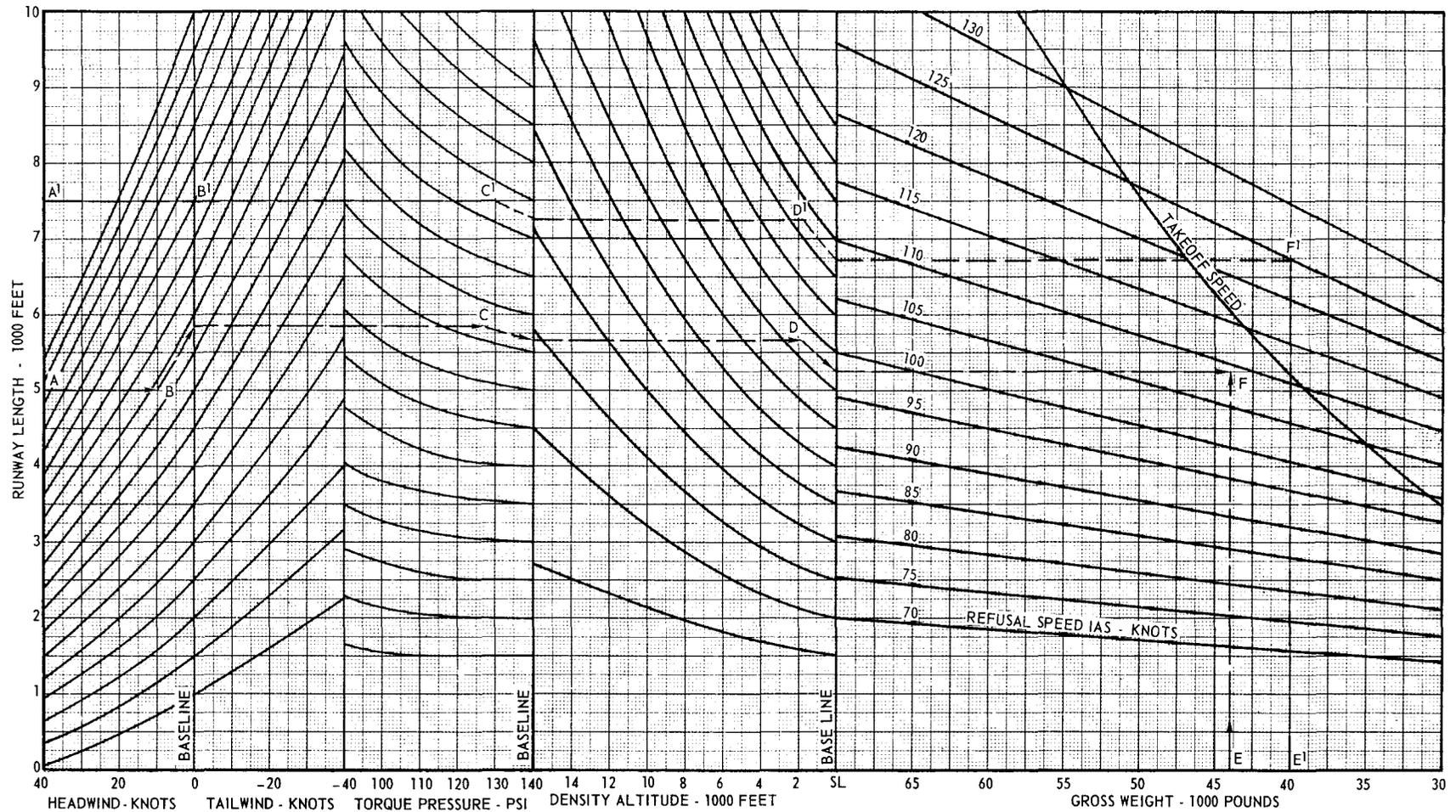
- (1) DISTANCES ARE BASED ON AUTO-FEATHERING AT CRITICAL ENGINE FAILURE SPEED.
- (2) TORQUE PRESSURE QUOTED IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE WILL BE 4.0 PSI LOWER.
- (3) 100% WIND ACCOUNTABILITY.
- (4) TAKEOFF SPEEDS ARE 1.2 V<sub>S</sub>, EXCEPT TO THE LEFT OF THE DASHED LINE TAKEOFF SPEEDS ARE 1.1 V<sub>MC</sub>. SEE TAKEOFF AND MINIMUM CONTROL SPEEDS CHART.

Figure IA3-11

MODEL: T29A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST

REFUSAL SPEED (12° FLAP)

ENGINES R2800 - 97



- CONDITIONS:**
- (1) WING FLAPS AT 12°
  - (2) DRY HARD SURFACE RUNWAY
  - (3) NACELLE FLAPS MIDPOSITION
  - (4) CABIN COMPRESSOR ON

- NOTES:**
- (1) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE PRESSURE WILL BE 4.0 PSI LOWER.
  - (2) 100% WIND ACCOUNTABILITY
  - (3) BASED ON PILOT REACTION TIME 6 SECONDS.

Figure 1A3-12

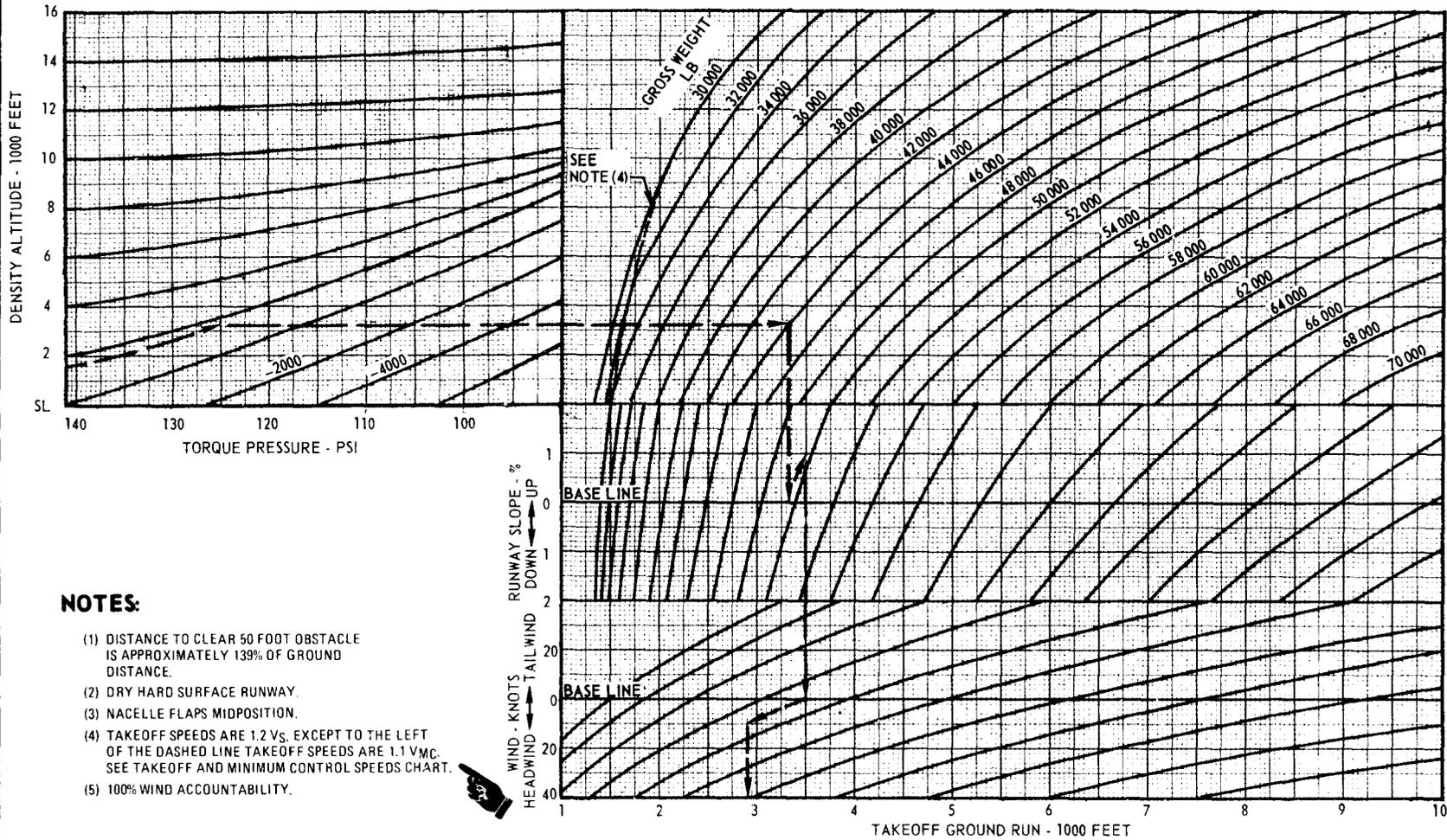
45,441D

MODEL: T-29A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

**TAKEOFF GROUND RUN (12° FLAP)**  
 CONTINUOUS TWO ENGINE OPERATION

2800 RPM

ENGINES: R2800-97



**NOTES:**

- (1) DISTANCE TO CLEAR 50 FOOT OBSTACLE IS APPROXIMATELY 139% OF GROUND DISTANCE.
- (2) DRY HARD SURFACE RUNWAY.
- (3) NACELLE FLAPS MIDPOSITION.
- (4) TAKEOFF SPEEDS ARE 1.2 V<sub>s</sub>, EXCEPT TO THE LEFT OF THE DASHED LINE TAKEOFF SPEEDS ARE 1.1 V<sub>MC</sub>. SEE TAKEOFF AND MINIMUM CONTROL SPEEDS CHART.
- (5) 100% WIND ACCOUNTABILITY.

SEE NOTE (4)

BASE LINE

BASE LINE

WIND - KNOTS  
 HEADWIND ↑  
 TAILWIND ↓

RUNWAY SLOPE - %  
 UP ↑  
 DOWN ↓

Figure IA3-13

Change 3 IA3-21

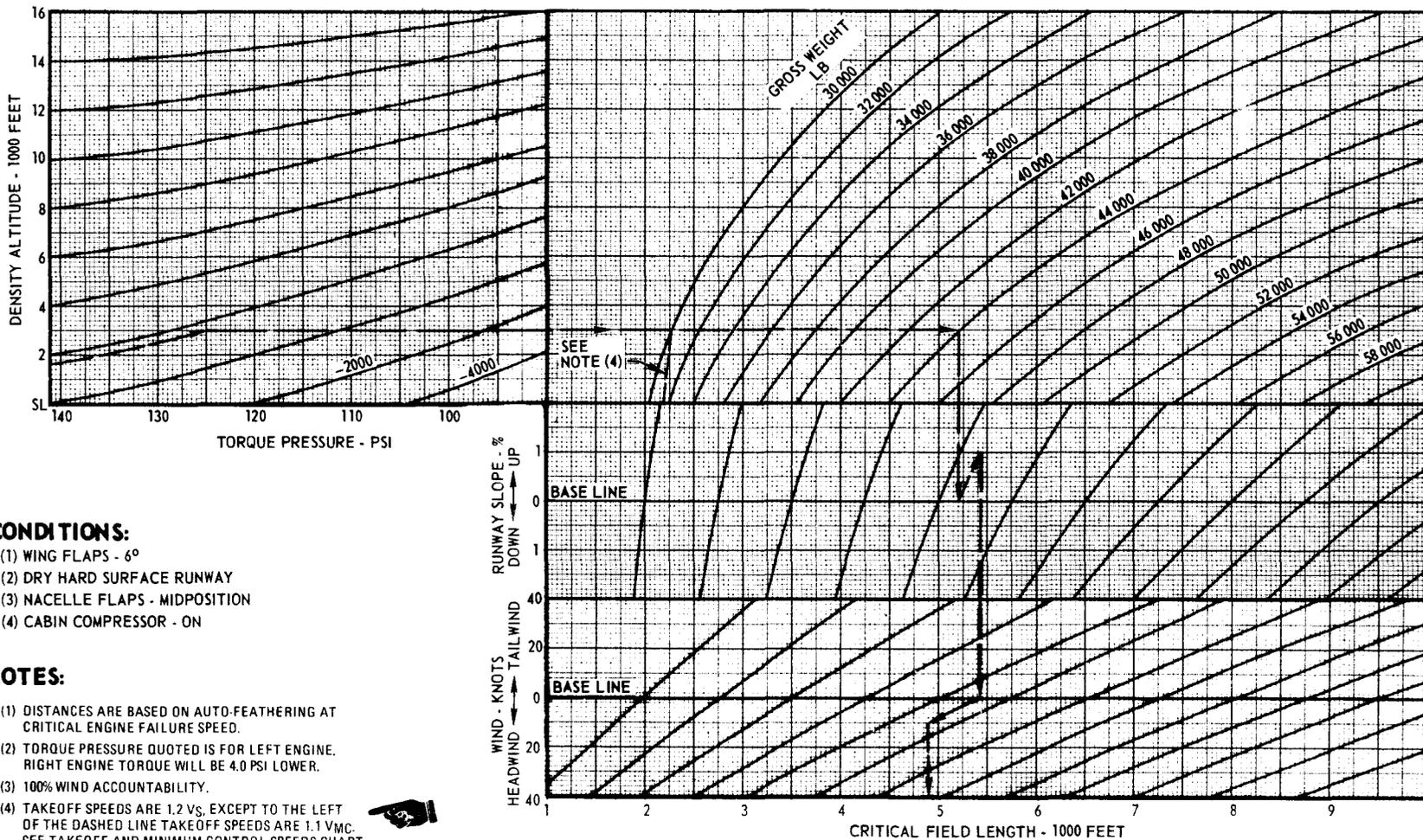
45,443D

MODEL: T-29 A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST

### CRITICAL FIELD LENGTH (6° FLAP)

2800 RPM

ENGINES: R2800-97



**CONDITIONS:**

- (1) WING FLAPS - 6°
- (2) DRY HARD SURFACE RUNWAY
- (3) NACELLE FLAPS - MIDPOSITION
- (4) CABIN COMPRESSOR - ON

**NOTES:**

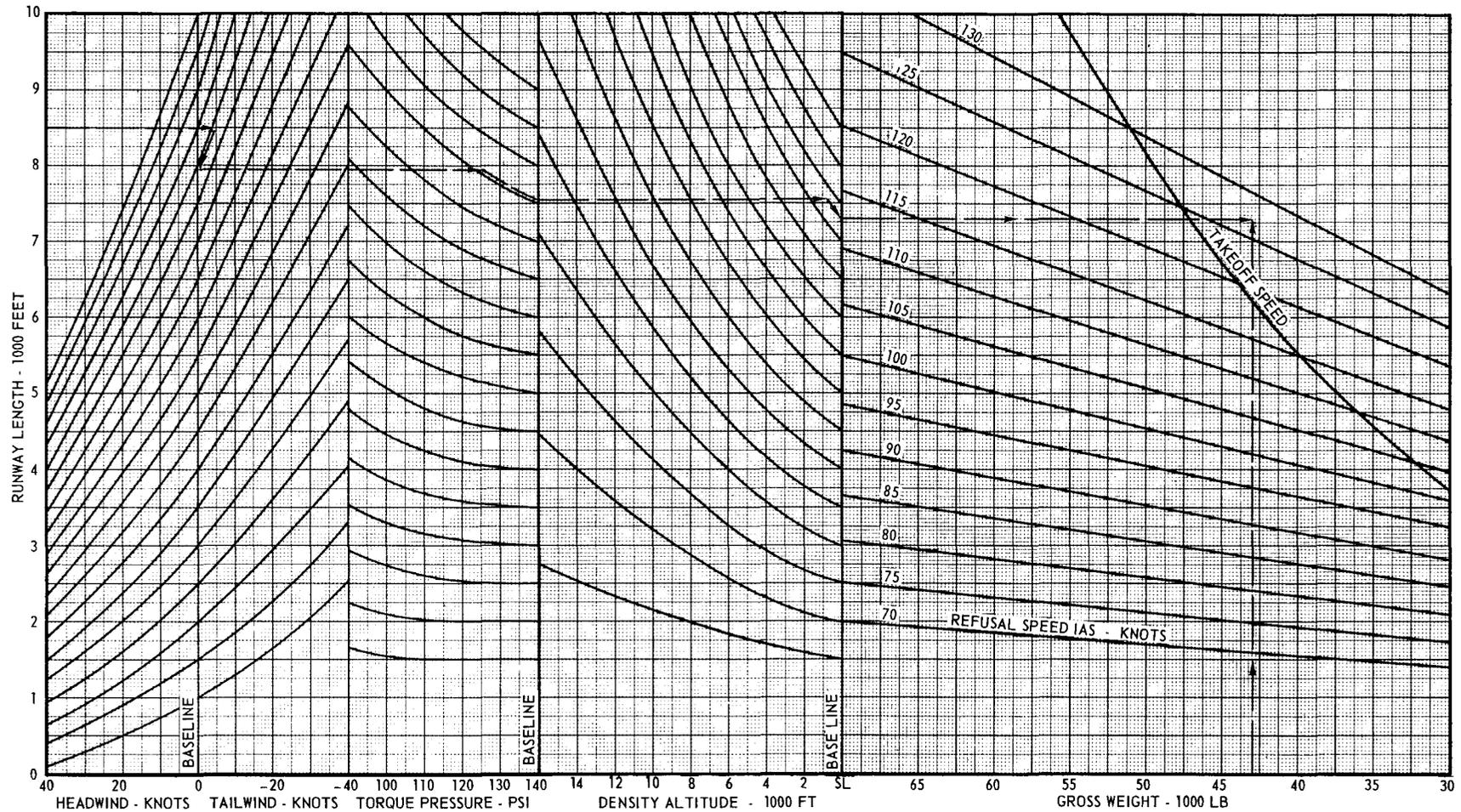
- (1) DISTANCES ARE BASED ON AUTO-FEATHERING AT CRITICAL ENGINE FAILURE SPEED.
- (2) TORQUE PRESSURE QUOTED IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE WILL BE 4.0 PSI LOWER.
- (3) 100% WIND ACCOUNTABILITY.
- (4) TAKEOFF SPEEDS ARE 1.2 VS, EXCEPT TO THE LEFT OF THE DASHED LINE TAKE OFF SPEEDS ARE 1.1 VMC. SEE TAKEOFF AND MINIMUM CONTROL SPEEDS CHART.

Figure 1A3-14

MODEL: T29A / B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

### REFUSAL SPEED (6° FLAP)

ENGINES: R2800 - 97



**CONDITIONS:** (1) WING FLAPS AT 6°  
 (2) DRY HARD SURFACE RUNWAY  
 (3) NACELLE FLAPS MIDPOSITION  
 (4) CABIN COMPRESSOR ON

**NOTES:** (1) TORQUE PRESSURE IS FOR LEFT ENGINE.  
 RIGHT ENGINE TORQUE PRESSURE WILL  
 BE 4.0 PSI LOWER.  
 (2) 100% WIND ACCOUNTABILITY  
 (3) BASED ON PILOT REACTION TIME 6 SECONDS.

45,444D

Figure 1A3-15

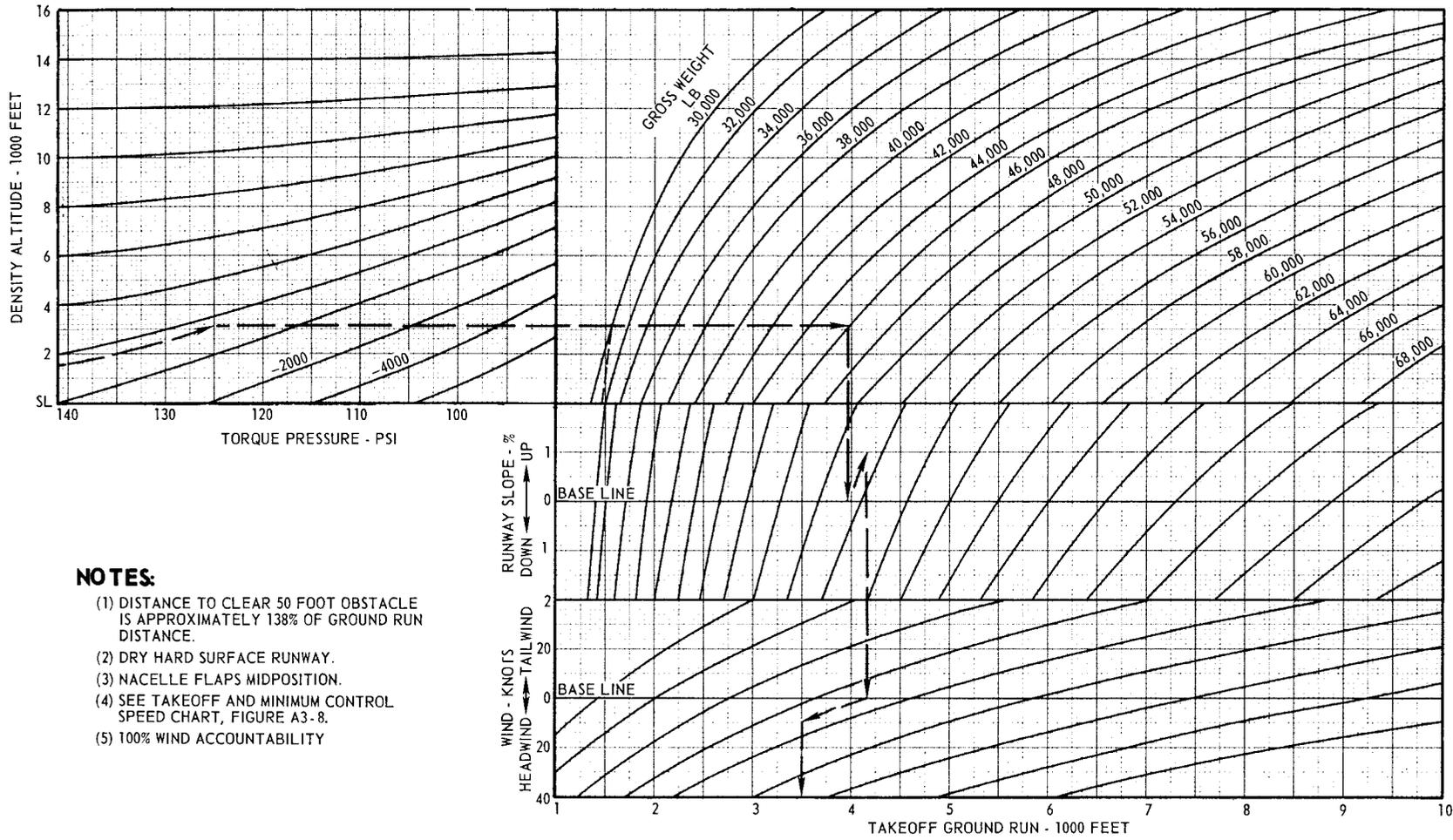
### TAKEOFF GROUND RUN ( 6° FLAP )

CONTINUOUS TWO ENGINE OPERATION

2800 RPM

ENGINES: R2800-97

MODEL: T-29A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST



**NOTES:**

- (1) DISTANCE TO CLEAR 50 FOOT OBSTACLE IS APPROXIMATELY 138% OF GROUND RUN DISTANCE.
- (2) DRY HARD SURFACE RUNWAY.
- (3) NACELLE FLAPS MIDPOSITION.
- (4) SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A3-8.
- (5) 100% WIND ACCOUNTABILITY

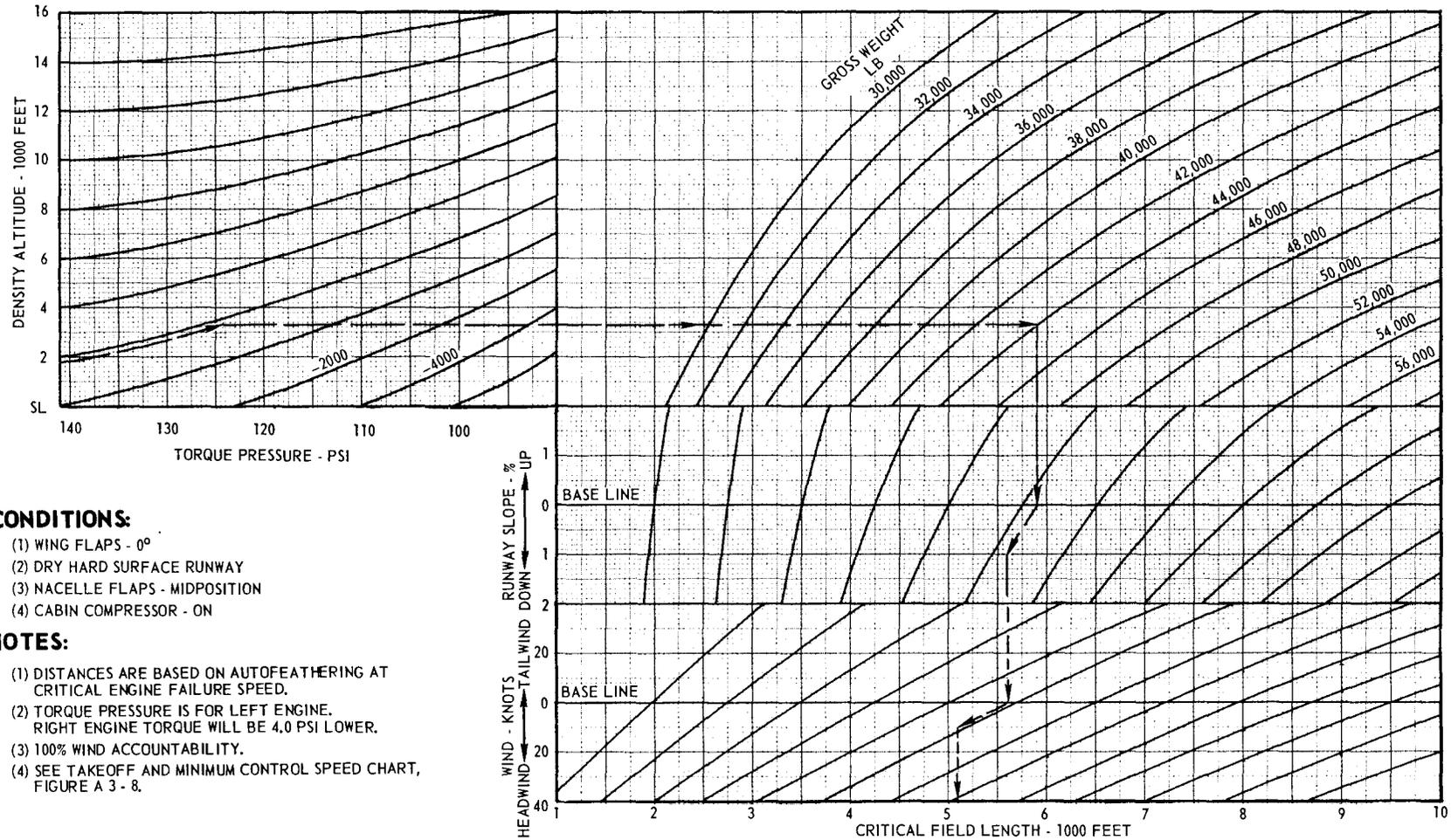
Figure IA3-16

# CRITICAL FIELD LENGTH (0° FLAP)

MODEL: T-29A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

2800 RPM

ENGINES: R2800-97



**CONDITIONS:**

- (1) WING FLAPS - 0°
- (2) DRY HARD SURFACE RUNWAY
- (3) NACELLE FLAPS - MIDPOSITION
- (4) CABIN COMPRESSOR - ON

**NOTES:**

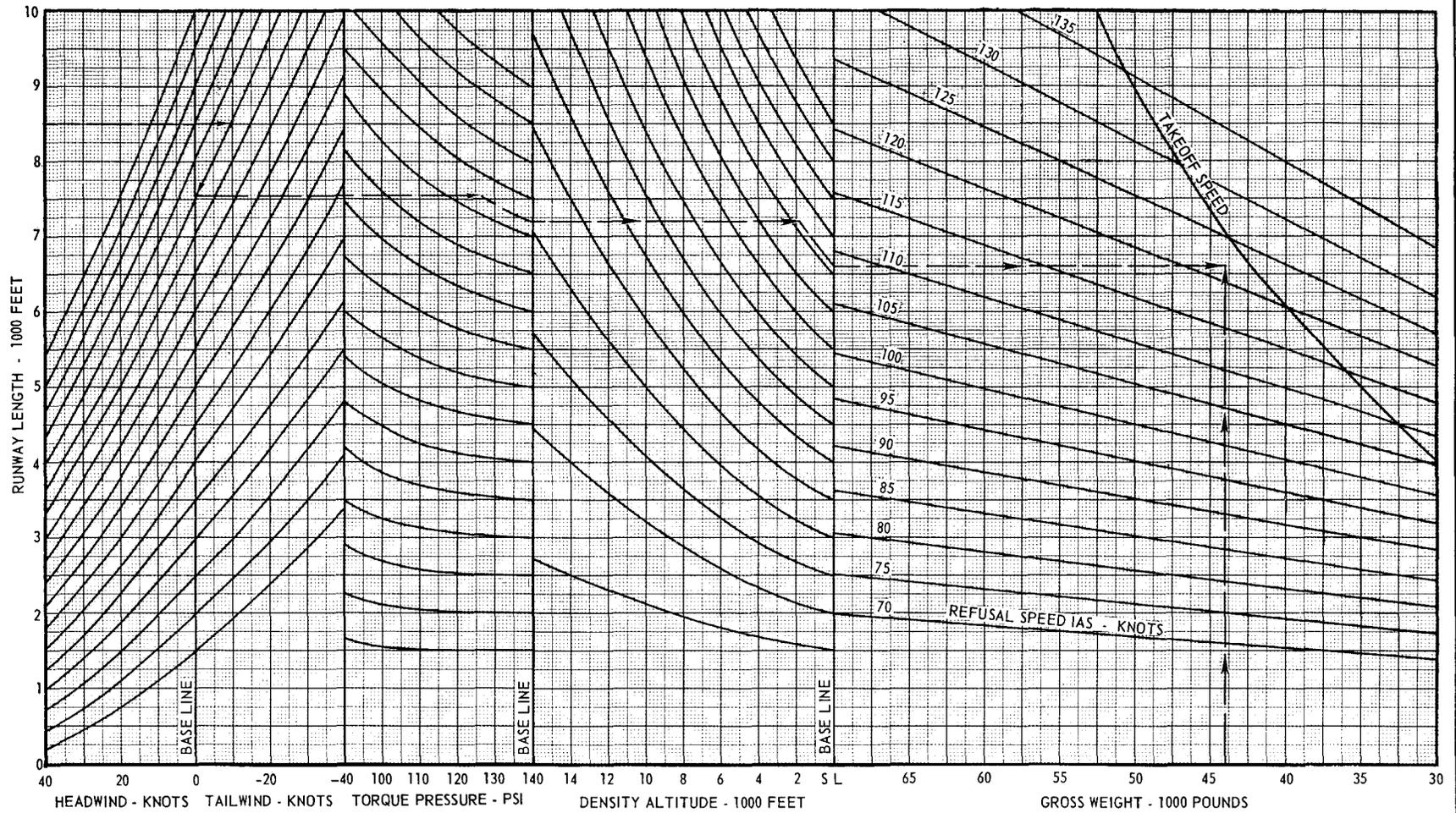
- (1) DISTANCES ARE BASED ON AUTOFEATHERING AT CRITICAL ENGINE FAILURE SPEED.
- (2) TORQUE PRESSURE IS FOR LEFT ENGINE. RIGHT ENGINE TORQUE WILL BE 4.0 PSI LOWER.
- (3) 100% WIND ACCOUNTABILITY.
- (4) SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A 3 - 8.

Figure IA3-17

### REFUSAL SPEED (0° FLAP)

MODEL: T29A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST

ENGINES: R2800 - 97



**CONDITIONS:** (1) WING FLAPS AT 0°  
(2) DRY HARD SURFACE RUNWAY  
(3) NACELLE FLAPS MIDPOSITION  
(4) CABIN COMPRESSOR ON

**NOTES:** (1) TORQUE PRESSURE IS FOR LEFT ENGINE, RIGHT ENGINE TORQUE PRESSURE WILL BE 4.0 PSI LOWER.  
(2) 100% WIND ACCOUNTABILITY  
(3) BASED ON PILOT REACTION TIME 6 SECONDS.

45,447D

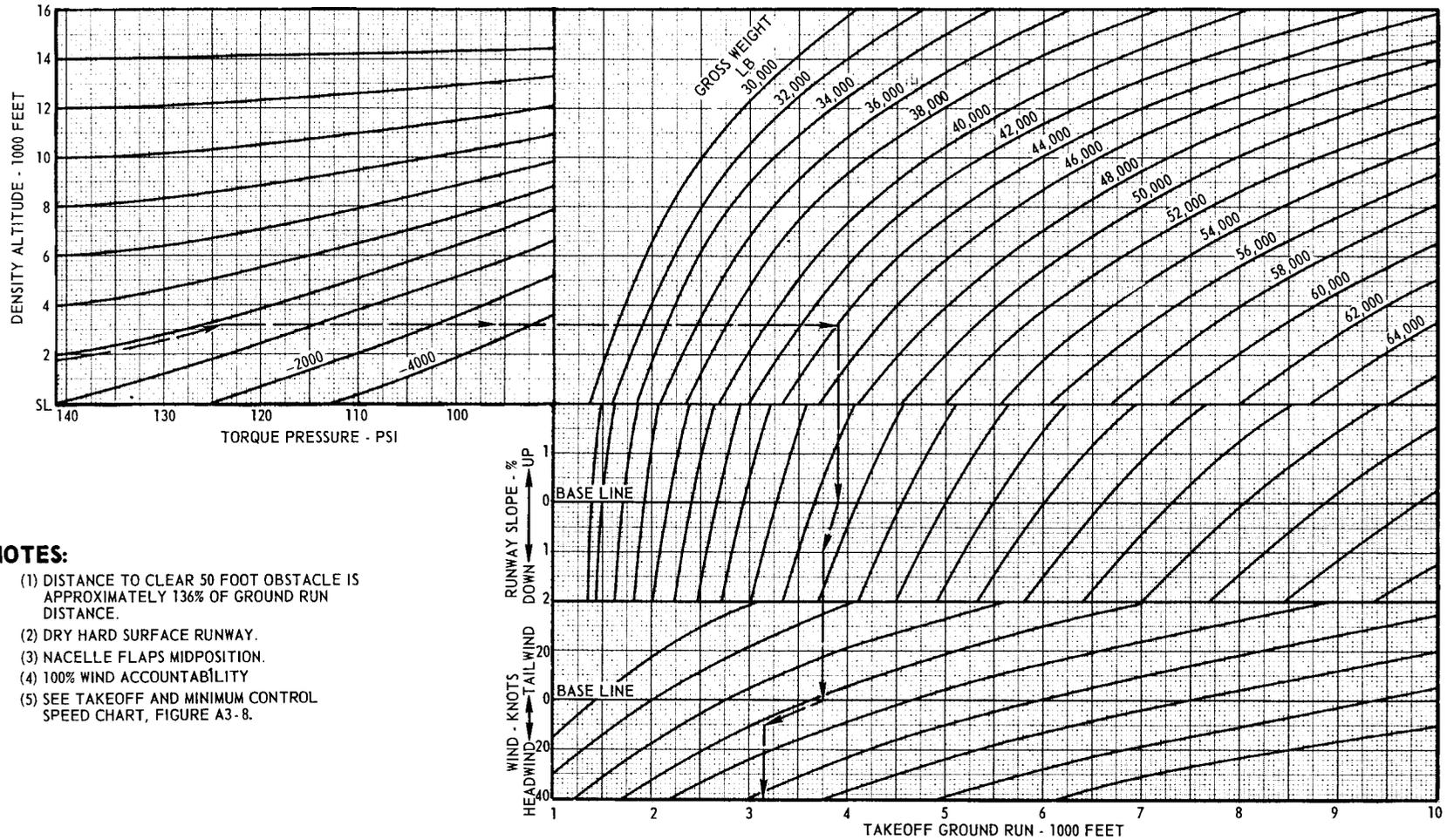
Figure 1A3-18

# TAKEOFF GROUND RUN (0° FLAP)

MODEL: T-29A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

CONTINUOUS TWO ENGINE OPERATION  
 2800 RPM

ENGINES: R2800-97



**NOTES:**

- (1) DISTANCE TO CLEAR 50 FOOT OBSTACLE IS APPROXIMATELY 136% OF GROUND RUN DISTANCE.
- (2) DRY HARD SURFACE RUNWAY.
- (3) NACELLE FLAPS MIDPOSITION.
- (4) 100% WIND ACCOUNTABILITY
- (5) SEE TAKEOFF AND MINIMUM CONTROL SPEED CHART, FIGURE A3-8.

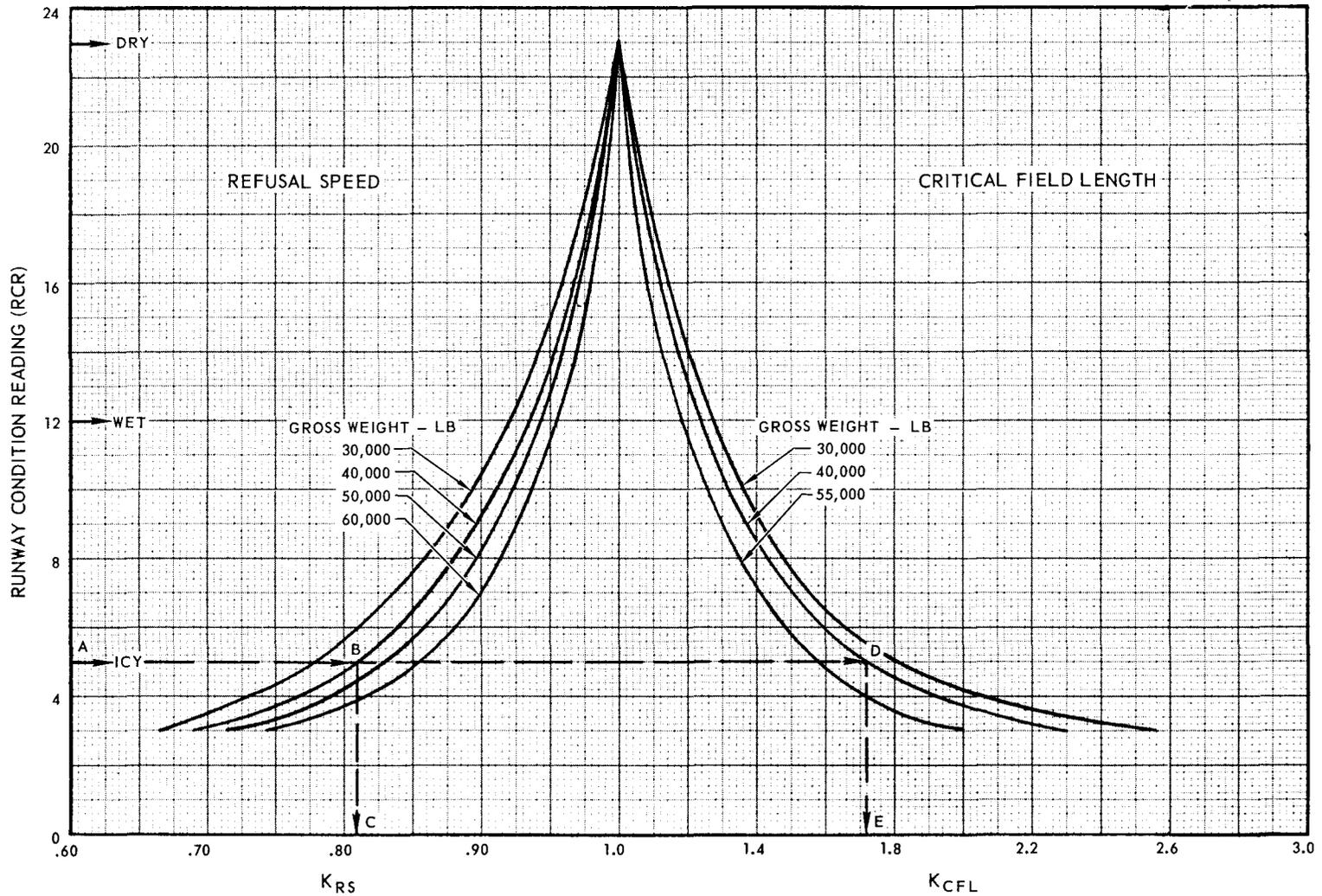
Figure IA3-19

45,449C

MODEL: T-29A/B  
DATE: 13 JULY 1964  
DATA BASIS: ESTIMATED

EFFECT OF RUNWAY SURFACE CONDITIONS  
REFUSAL SPEED AND CRITICAL FIELD LENGTH CORRECTIONS  
ALL FLAP SETTINGS

ENGINES: R2800-97



CORRECTED REFUSAL SPEED =  $K_{RS} \times$  REFUSAL SPEED FROM CHARTS

CORRECTED CRITICAL FIELD LENGTH =  $K_{CFL} \times$  CRITICAL FIELD LENGTH FROM CHARTS

NOTE: IF NO RCR IS AVAILABLE, USE 12 FOR WET RUNWAYS AND 5 FOR ICY RUNWAYS.

45,977B

Figure IA3-20

MODEL: T-29A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST

**CLIMBOUT FACTOR FOR CLIMBOUT FLIGHT PATH**  
FOR ALL FLAP SETTINGS TWO AND ONE ENGINE OPERATION  
2800 RPM

ENGINES: R2800-97

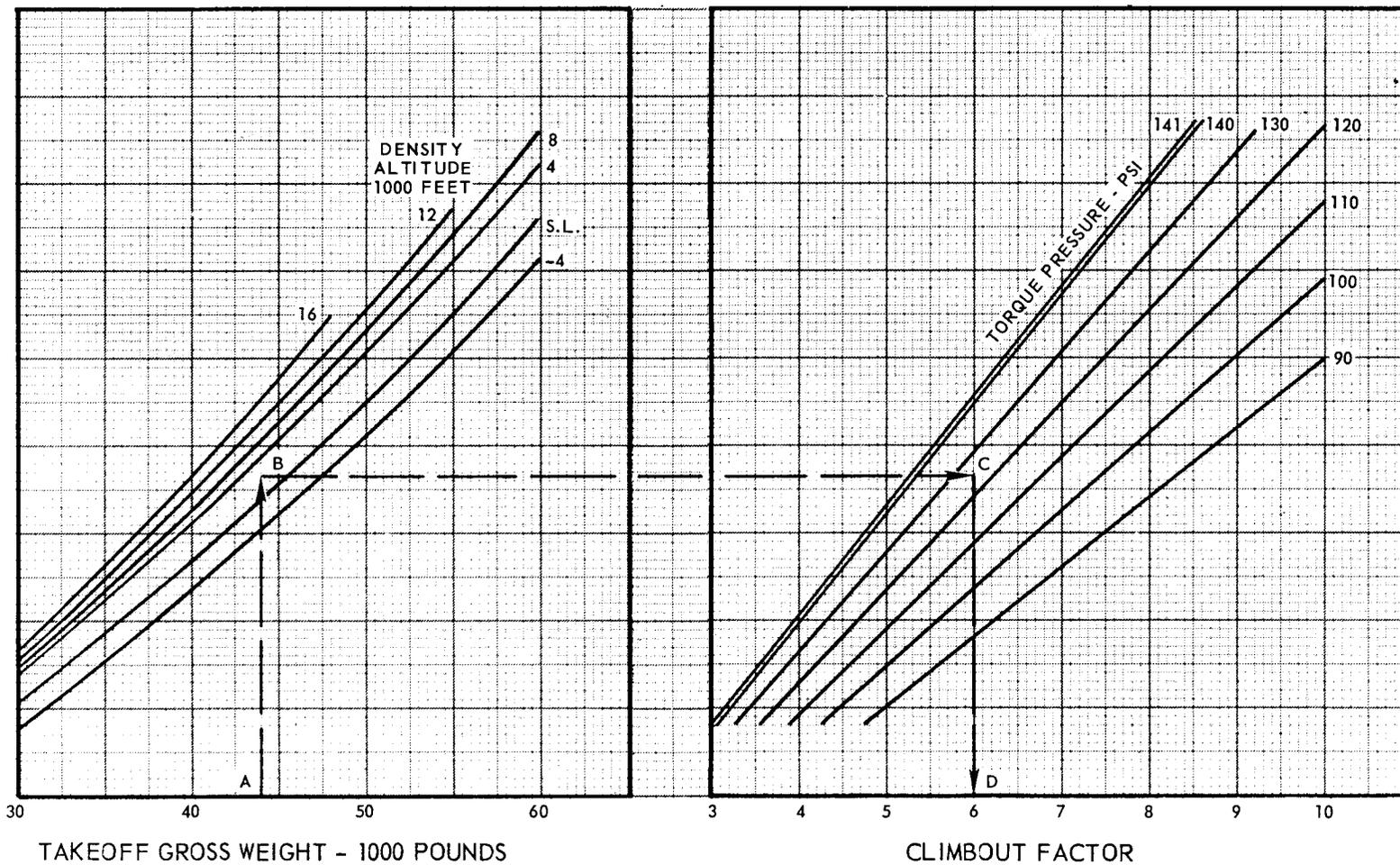


Figure IA3-21

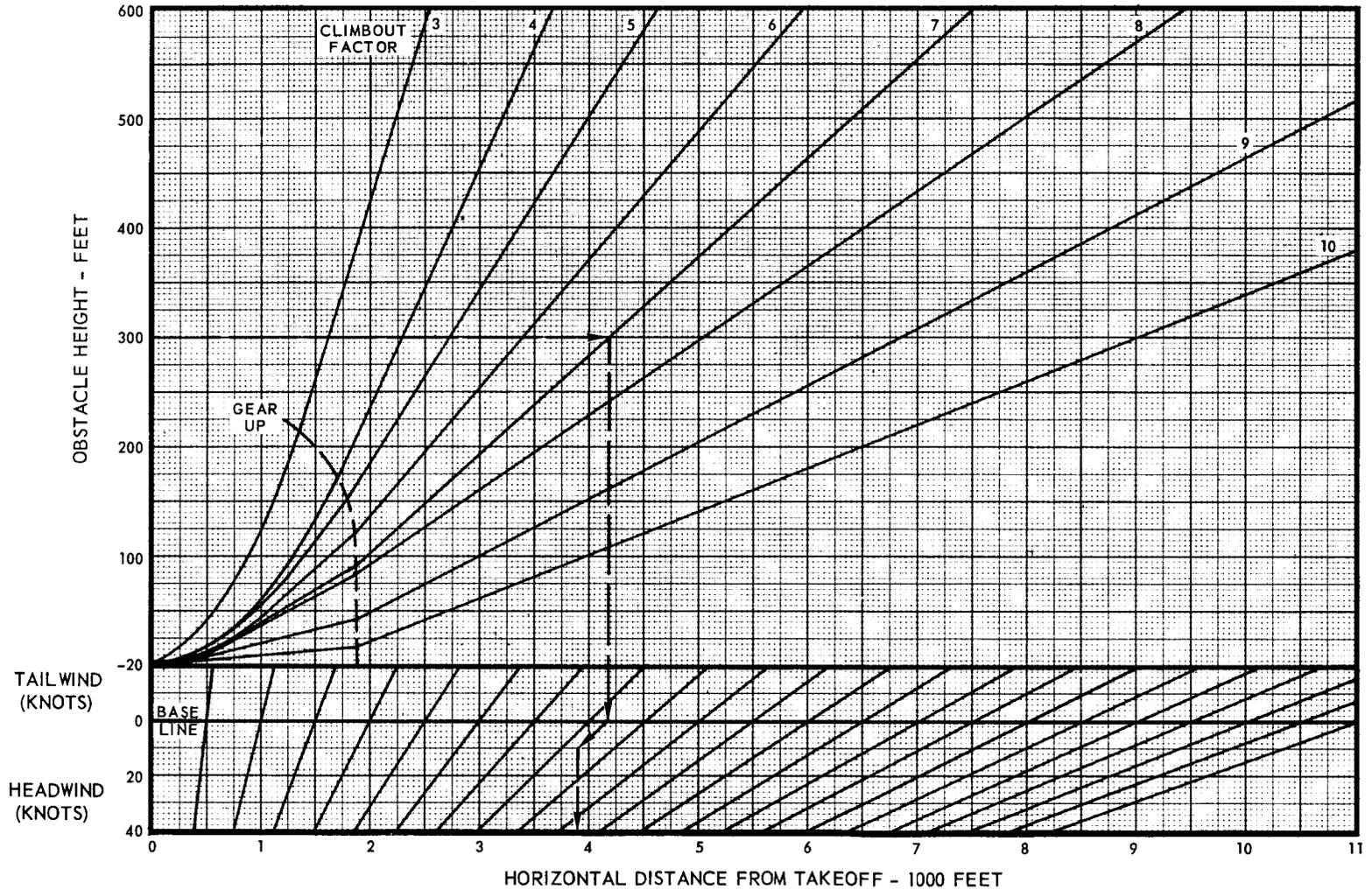
T.O. 1T-29A-1

IA3-29

MODEL: **T-29A/B**  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

**CLIMBOUT FLIGHT PATH - TWO ENGINE - 0° FLAP**  
 INCLUDING FLARE DISTANCE  
 2800 RPM  
 OBSTACLE HEIGHT 0 - 600 FEET

ENGINES: R2800 - 97



**NOTES:**

- (1) LANDING GEAR UP IN 6 SECONDS
- (2) CLIMB SPEED = TAKEOFF SPEED
- (3) 100% WIND ACCOUNTABILITY

45,463

Figure 1A3-22

### CLIMBOUT FLIGHT PATH - TWO ENGINE - 6° FLAP

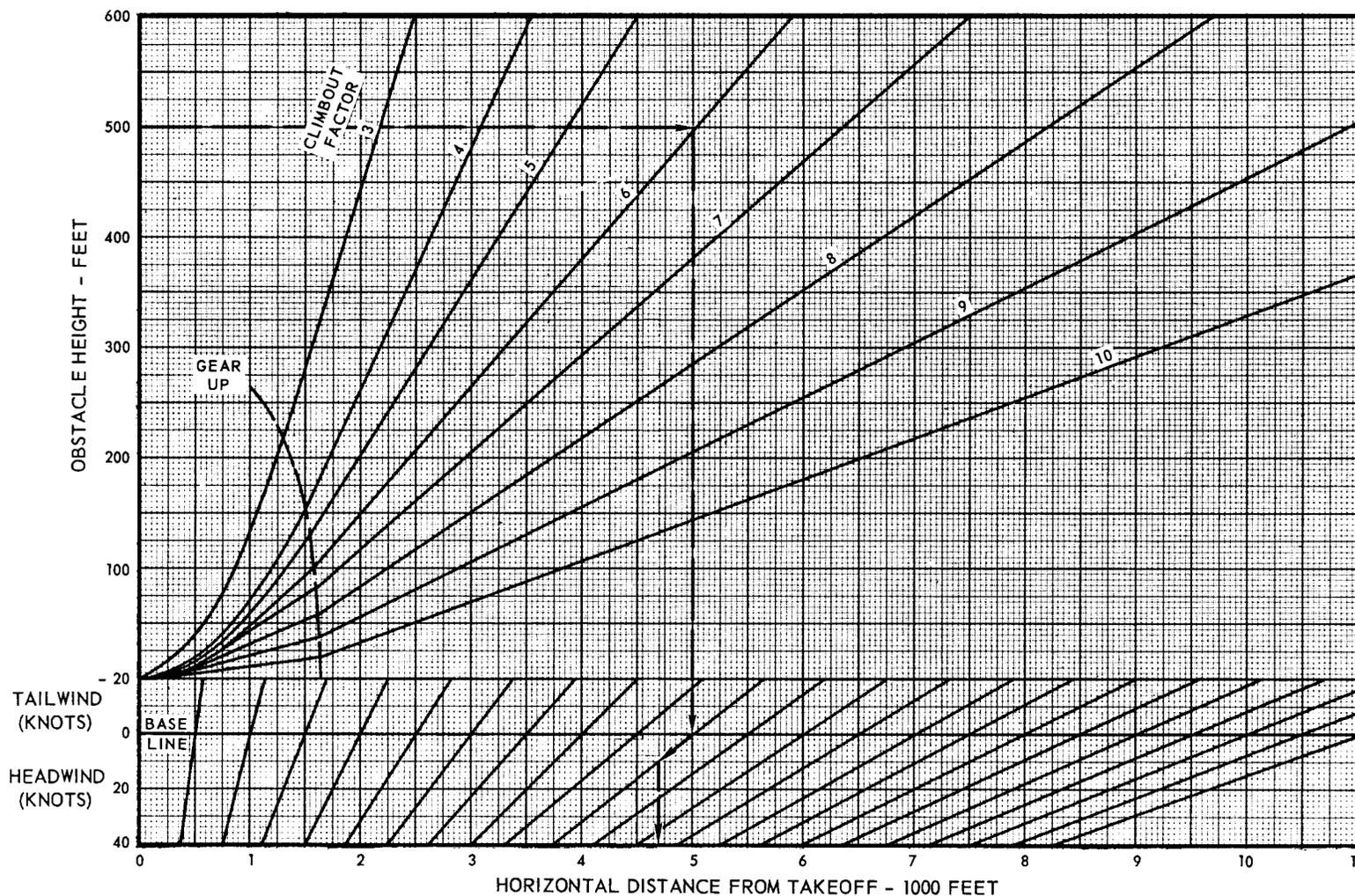
MODEL: T-29A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

INCLUDING FLARE DISTANCE

OBSTACLE HEIGHT 0 - 600 FEET

2800 RPM

ENGINES: R2800-1971



**NOTES:**

- (1) LANDING GEAR UP IN 6 SECONDS
- (2) CLIMB SPEED = TAKEOFF SPEED
- (3) 100% WIND ACCOUNTABILITY

45,464A

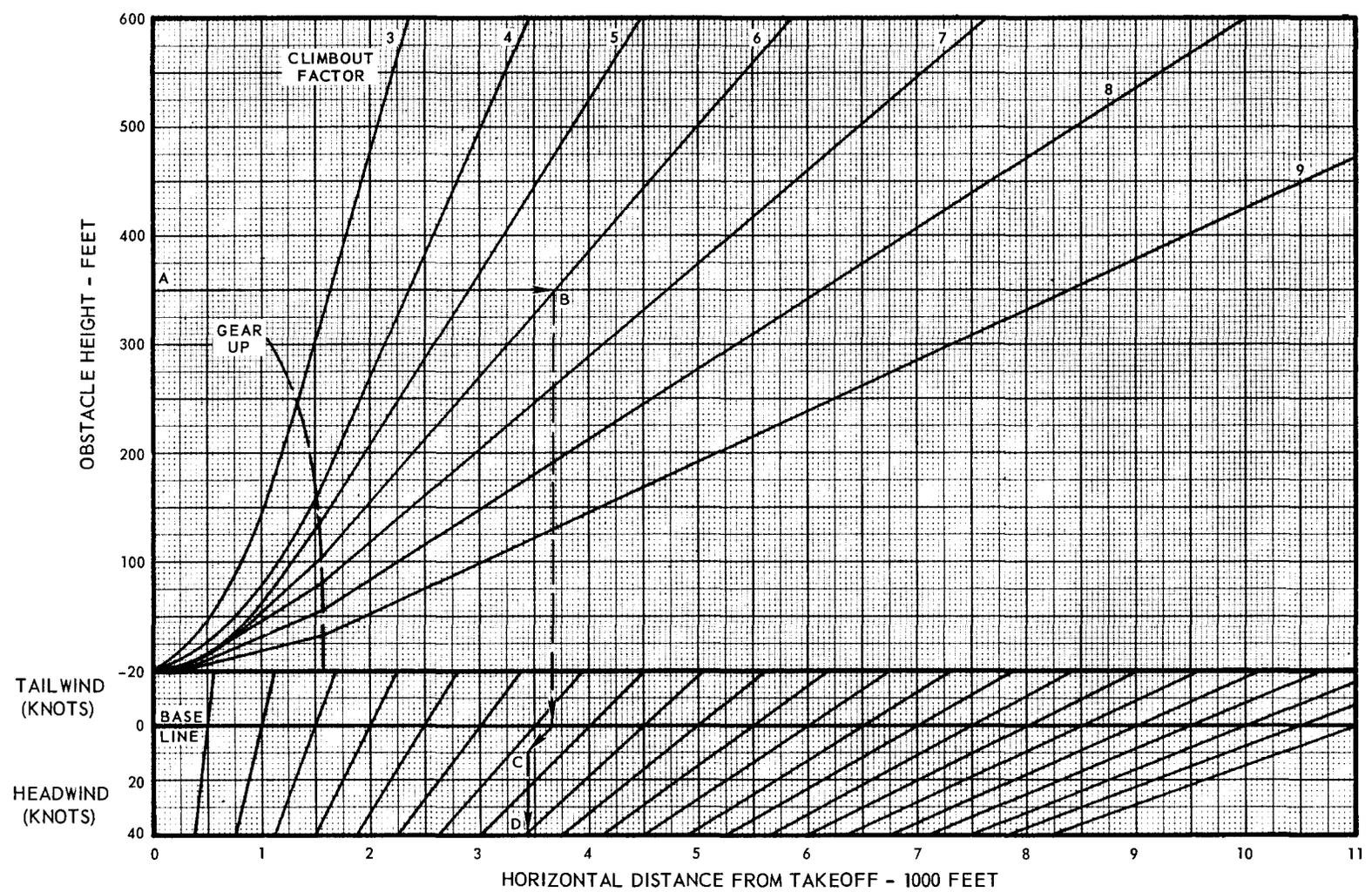
Figure 1A3-23

Change 1

1A3-31

**CLIMBOUT FLIGHT PATH - TWO ENGINE - 12° FLAP**  
 INCLUDING FLARE DISTANCE      OBSTACLE HEIGHT 0 - 600 FEET  
 2800 RPM      ENGINES: R2800 - 97

MODEL: **T - 29A/B**  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST



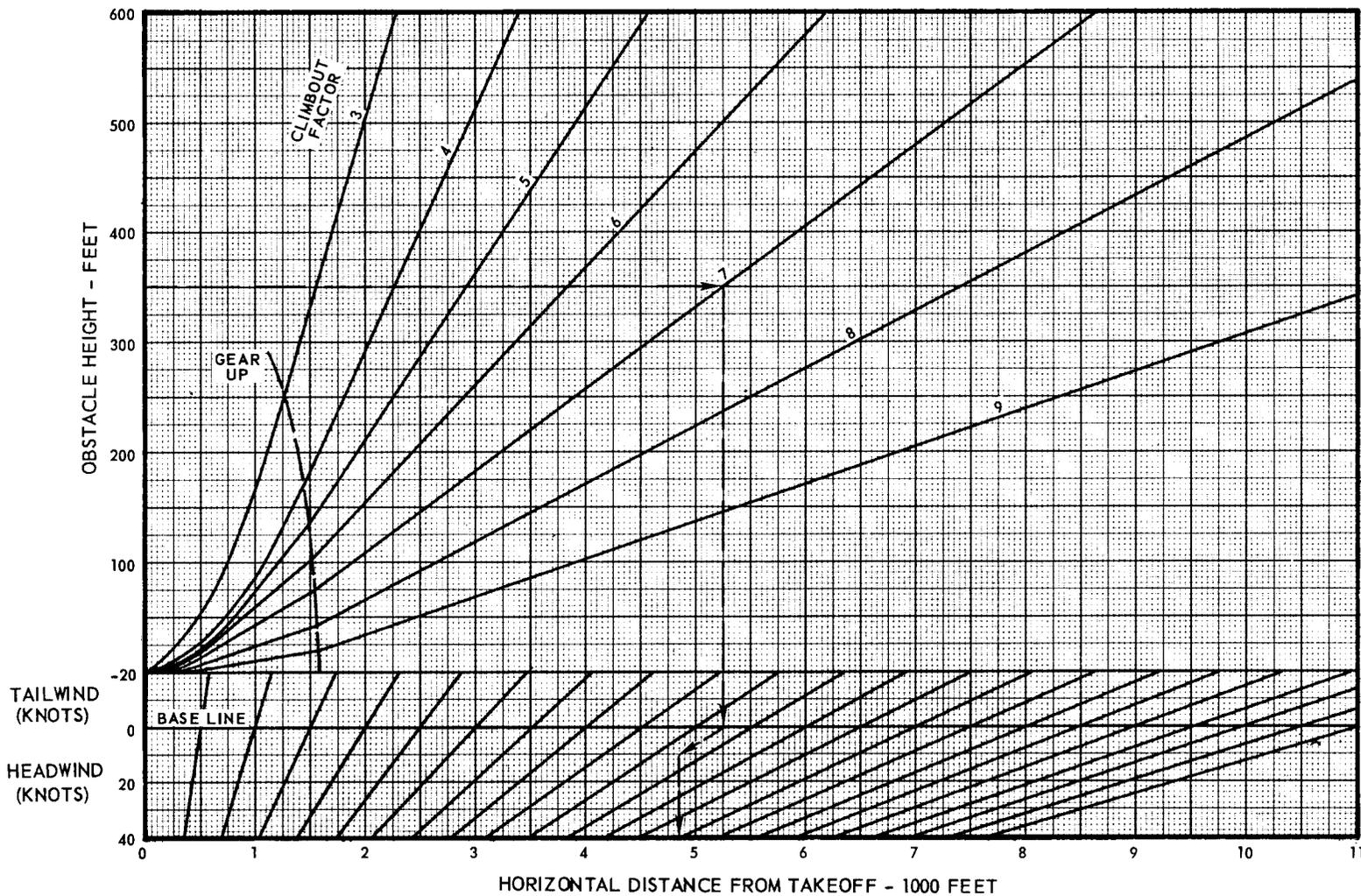
- NOTES:**
- (1) LANDING GEAR UP IN 6 SECONDS
  - (2) CLIMB SPEED = TAKEOFF SPEED
  - (3) 100% WIND ACCOUNTABILITY

Figure IA3-24

MODEL: T - 29 A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

**CLIMBOUT FLIGHT PATH - TWO ENGINE - 24° FLAP**  
 INCLUDING FLARE DISTANCE      OBSTACLE HEIGHT 0 - 600 FEET  
 2800 RPM

ENGINES: R2800 - 97



**NOTES:**

- (1) LANDING GEAR UP IN 6 SECONDS
- (2) CLIMB SPEED = TAKEOFF SPEED
- (3) 100% WIND ACCOUNTABILITY

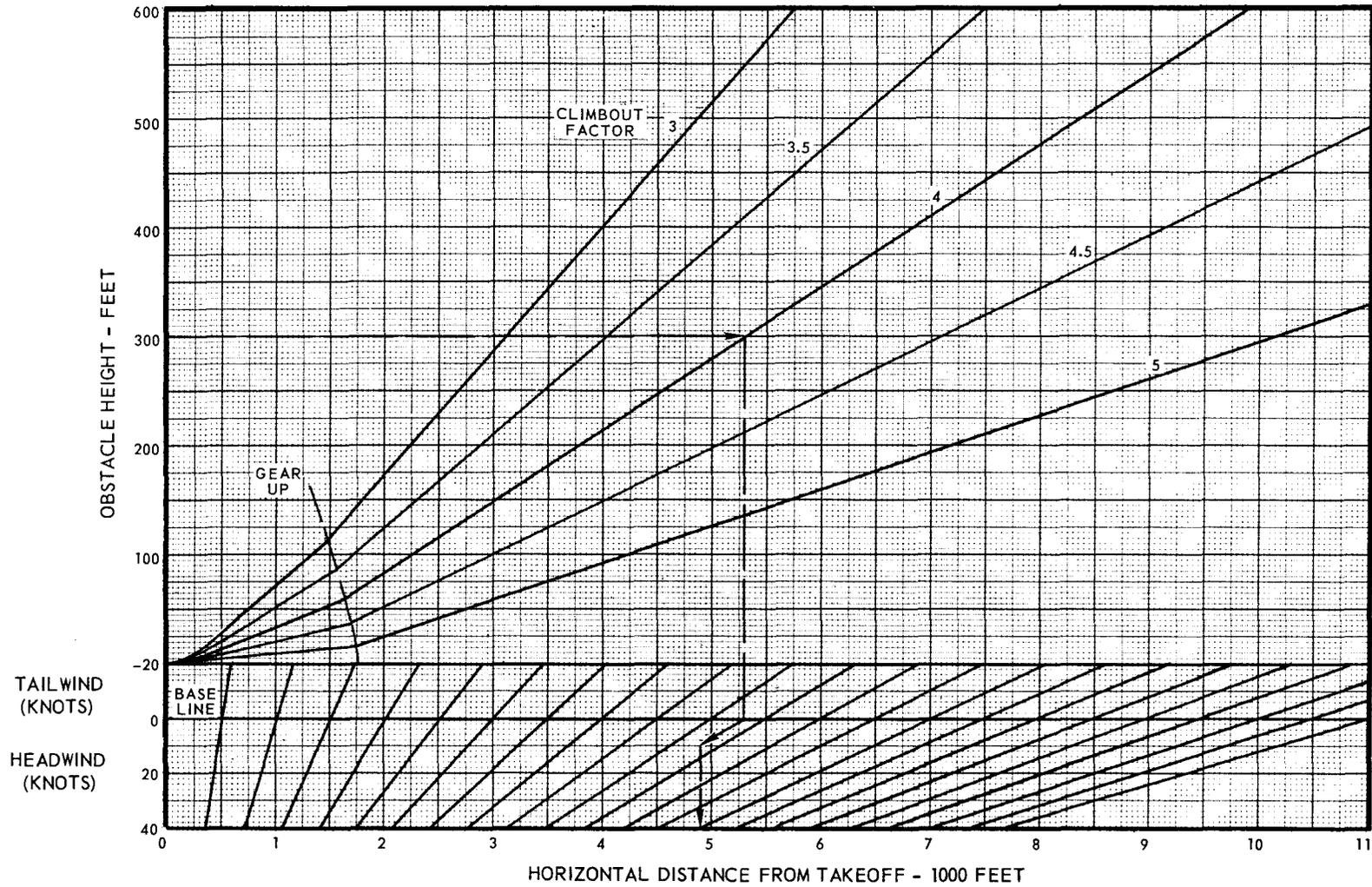
45,466

Figure 1A3-25

**CLIMBOUT FLIGHT PATH - SINGLE ENGINE - 0° FLAP**  
 INCLUDING FLARE DISTANCE OBSTACLE HEIGHT 0 - 600 FEET  
 2800 RPM

MODEL: T-29 A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

ENGINES: R2800-97



**NOTES:**

- (1) INOPERATIVE PROPELLER FEATHERED
- (2) LANDING GEAR UP IN 6 SECONDS
- (3) CLIMB SPEED = TAKEOFF SPEED
- (4) 100% WIND ACCOUNTABILITY

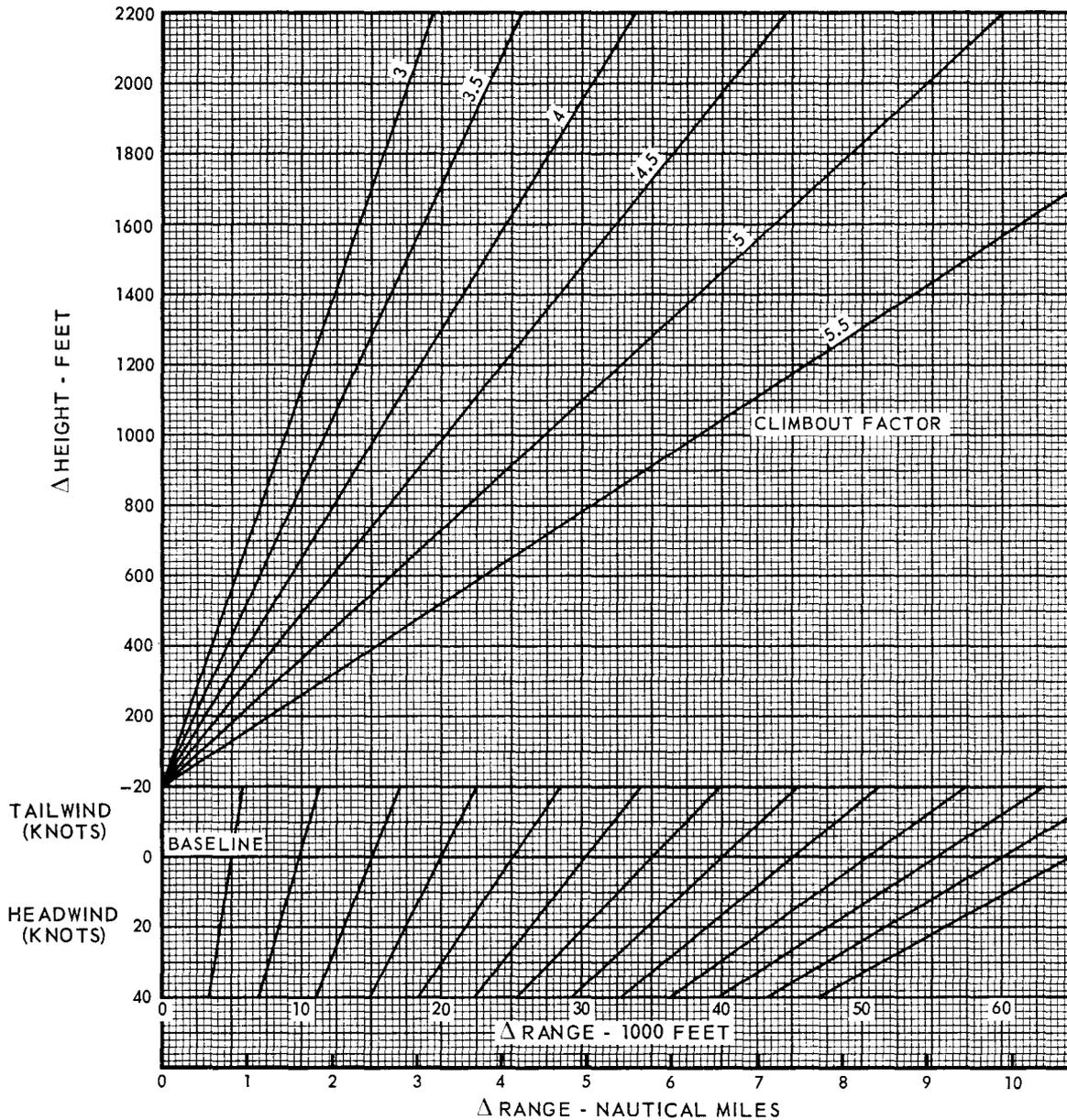
45467A

Figure IA3-26

MODEL: T-29A/B/C/D  
DATE: 5 DECEMBER 1967  
DATA BASIS: FLIGHT TEST

CLIMBOUT FLIGHT PATH (EXTENDED) -  
SINGLE ENGINE - 0° FLAPS  
2800 RPM

ENGINES: R2800-97/99W



NOTES:

- (1) CLIMB SPEED EQUALS 1.2 STALL SPEED (0° FLAPS).
- (2) 100% WIND ACCOUNTABILITY.
- (3) CHART ASSUMES THAT CLIMB PATH AND AIRSPEED HAVE BEEN ESTABLISHED BEFORE CHART IS ENTERED. USE CHART AS EXTENSION OF BASIC CLIMBOUT FLIGHT PATH CHARTS WHICH INCLUDE TAKEOFF ACCELERATION DATA.
- (4) USE CHART WITH CLIMBOUT FACTOR FROM 2800 RPM CLIMBOUT FACTOR CHART ONLY.

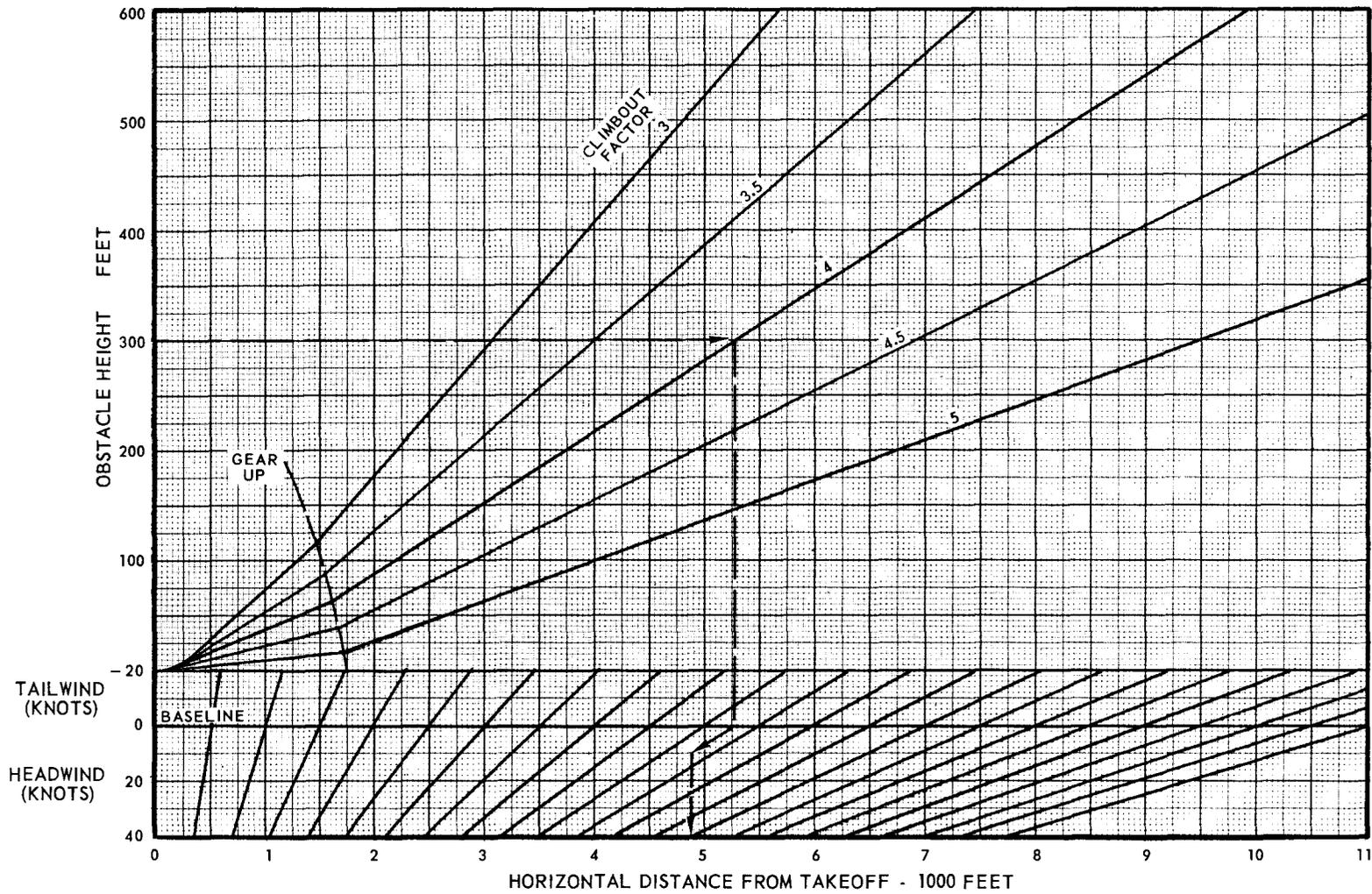
45,601

Figure 1A3-27

MODEL: T-29 A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST

CLIMBOUT FLIGHT PATH - SINGLE ENGINE - 6° FLAP  
INCLUDING FLARE DISTANCE OBSTACLE HEIGHT 0 - 600 FEET  
2800 RPM

ENGINES: R2800-97



**NOTES:**

- (1) INOPERATIVE PROPELLER FEATHERED
- (2) LANDING GEAR UP IN 6 SECONDS
- (3) CLIMB SPEED = TAKEOFF SPEED
- (4) 100% WIND ACCOUNTABILITY

45468A

Figure 1A3-28

# CLIMBOUT FLIGHT PATH - SINGLE ENGINE - 12° FLAP

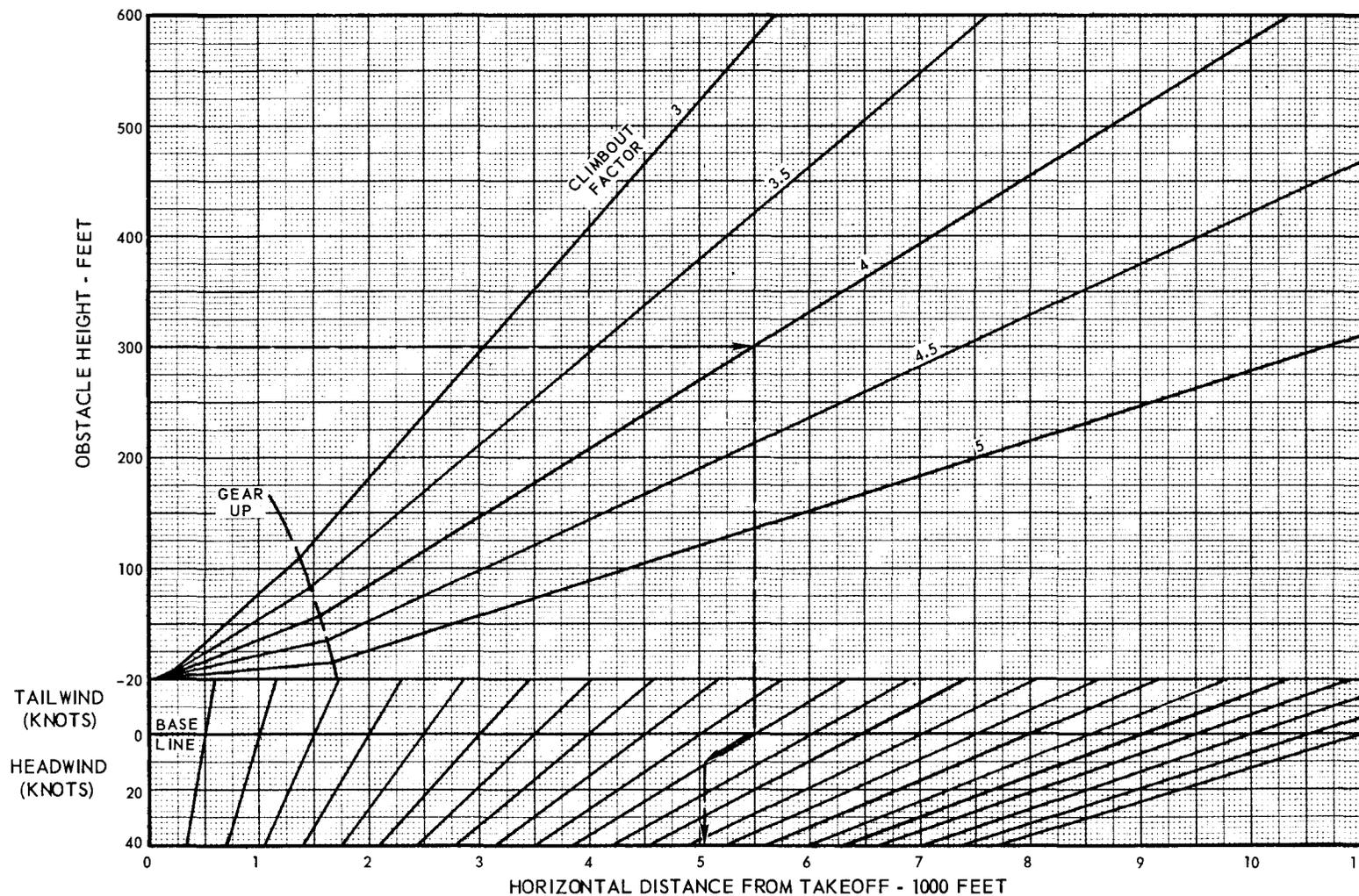
MODEL: T-29 A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

INCLUDING FLARE DISTANCE

OBSTACLE HEIGHT 0-600 FEET

2800 RPM

ENGINES: R2800-97



### NOTES:

- (1) INOPERATIVE PROPELLER FEATHERED
- (2) LANDING GEAR UP IN 6 SECONDS
- (3) CLIMB SPEED = TAKEOFF SPEED
- (4) 100% WIND ACCOUNTABILITY

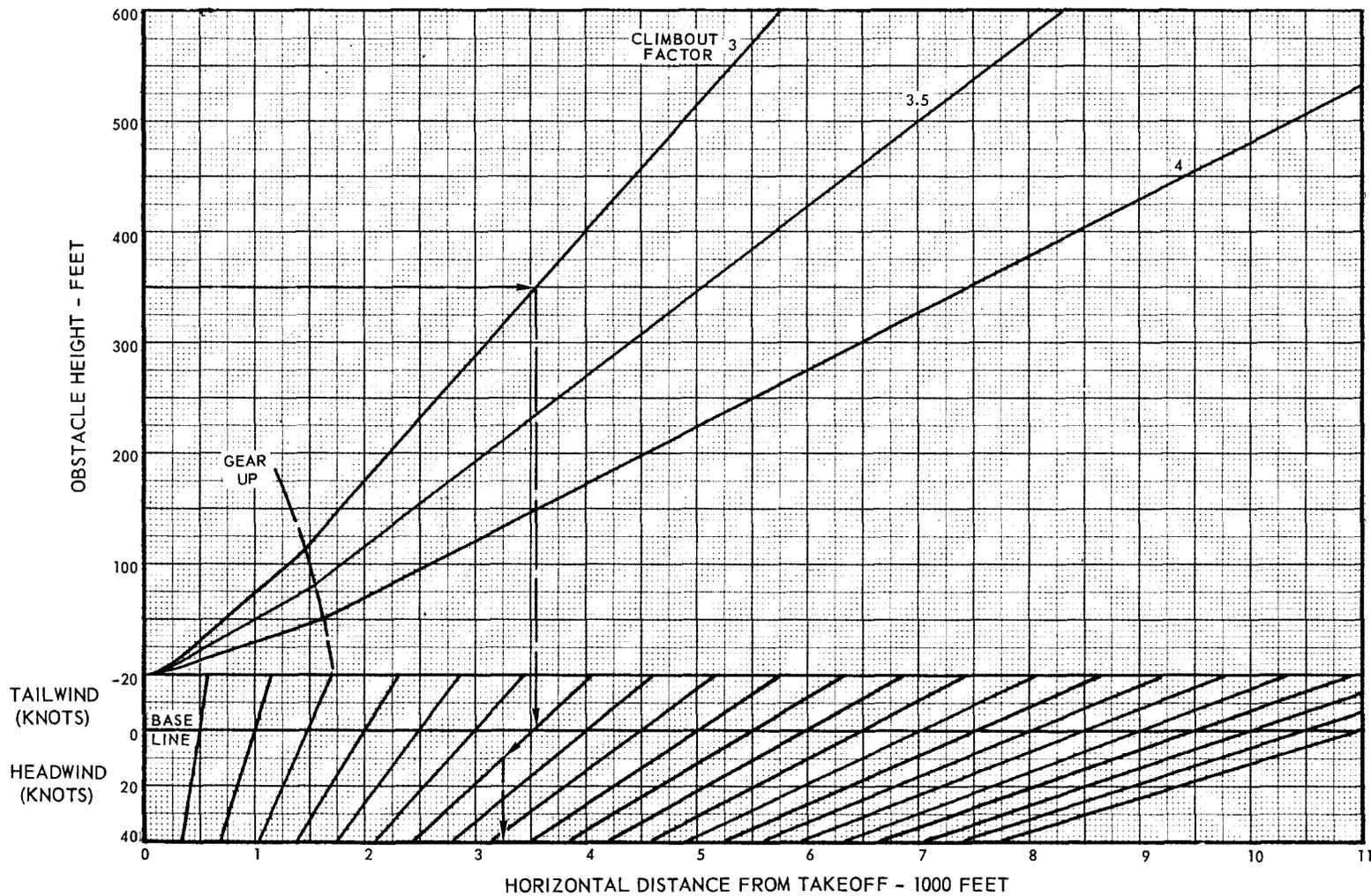
45469A

Figure IA3-29

**CLIMBOUT FLIGHT PATH - SINGLE ENGINE - 24° FLAP**  
 INCLUDING FLARE DISTANCE  
 OBSTACLE HEIGHT 0-600 FEET  
 2800 RPM

MODEL: T-29 A/B  
 DATE: 15 MARCH 1955  
 DATA BASIS: FLIGHT TEST

ENGINES: R2800-97



**NOTES:**

- (1) INOPERATIVE PROPELLER FEATHERED
- (2) LANDING GEAR UP IN 6 SECONDS
- (3) CLIMB SPEED = TAKEOFF SPEED
- (4) 100% WIND ACCOUNTABILITY

45470A

Figure 1A3-30

MODEL: T-29 A/B  
DATE: 5 DECEMBER 1967  
DATA BASIS: FLIGHT TEST

**CLIMBOUT FACTOR FOR CLIMBOUT FLIGHT PATH**  
FLAPS RETRACTED TWO ENGINE OPERATION

METO POWER  
(2500 RPM TO 2700 RPM)

ENGINES: R2800-97

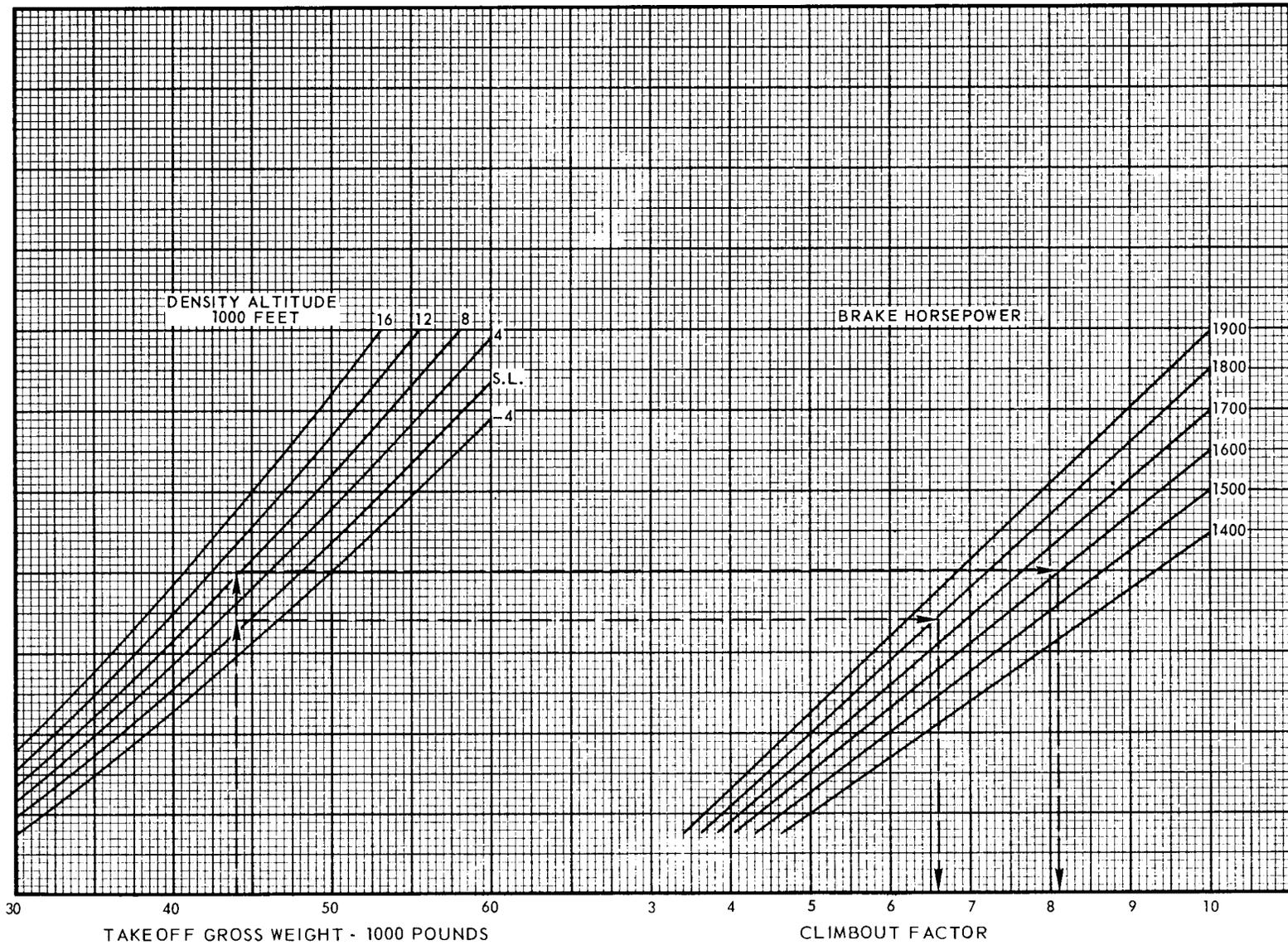


Figure IA3-31

IA3-39

T. O. 1T-29A-1

Appendix I  
Part 3

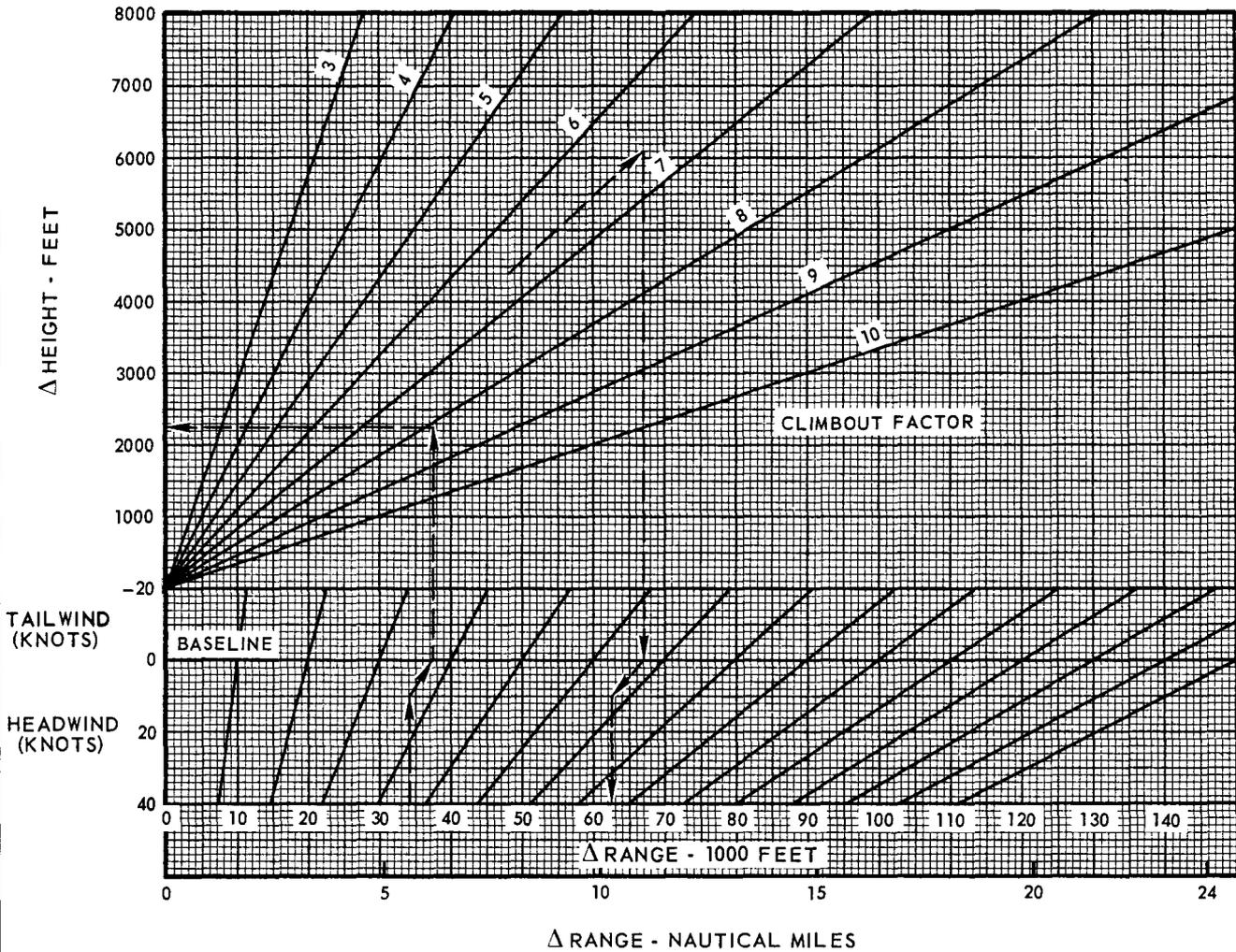
**CLIMBOUT FLIGHT PATH (EXTENDED)**

**TWO ENGINE - 0° FLAPS**

MODEL: T-29A/B  
DATE: 5 DECEMBER 1967  
DATA BASIS: FLIGHT TEST

METO POWER

ENGINES: R2800-97



**NOTES:**

- (1) CLIMB SPEED EQUALS 1.2 STALL SPEED (0° FLAPS).
- (2) 100% WIND ACCOUNTABILITY.
- (3) CHART ASSUMES THAT CLIMB PATH AND AIRSPEED HAVE BEEN ESTABLISHED BEFORE CHART IS ENTERED. USE CHART AS EXTENSION OF BASIC CLIMBOUT FLIGHT PATH CHARTS WHICH INCLUDE TAKEOFF ACCELERATION DATA.
- (4) USE CHART WITH CLIMBOUT FACTOR FROM METO POWER CLIMBOUT FACTOR CHART ONLY.

45,603

Figure 1A3-32

**PART 4 – CLIMB**

**A B**

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DRIFT-DOWN . . . . .	1A4-2
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*OPERATIONAL CLIMB - DISTANCE AND FUEL . . . . .	1A4-4
*METO POWER CLIMB - TIME AND SPEED . . . . .	1A4-5
*METO POWER CLIMB - DISTANCE AND FUEL . . . . .	1A4-6
*CEILING - ONE ENGINE INOPERATIVE . . . . .	1A4-7
*DRIFT-DOWN - ONE ENGINE INOPERATIVE . . . . .	1A4-8

The symbol \* indicates an illustration

**OPERATIONAL CLIMB**

Operational climb performance is presented in two climb curves for normal two-engine operation (figures 1A4-1 and 1A4-2). One presents time and fuel consumed. The other presents distance and fuel consumed. The data are plotted in a convenient form against weight with guide lines representing the weight variation during a steady climb. The data are based upon recommended climb at 1400 BHP/ENG, 2400 rpm in standard atmosphere with flaps and gear up at a constant airspeed. The climb power schedules show power settings to be used. These include manifold pressure, TPSI and blower speed. Fuel flow is based upon operation in the AUTO RICH mixture position. Climb performance in non-standard atmospheric conditions is the same as that in standard atmospheric conditions if standard powers are obtainable. It is only necessary to determine the comparable density altitude and obtain the standard power for that altitude.

**Note**

The airplane's lift and drag depend primarily upon the density of the air, while the engine power depends upon the pressure of the air, until full throttle is reached. To determine the climb performance under non-

standard conditions, one must determine the fuel, distance and time to climb using density altitudes and obtain the standard power for pressure altitude by adjusting the manifold pressures as required.

If standard powers are not obtainable, a substantial decrease in climb performances can be expected. Speeds shown are those for best rate of climb consistent with engine cooling. Increasing speeds above those shown will decrease the rate of climb and increase time, distance, and fuel consumed in climb. Data are included to show the service (100 fpm rate of climb) and cruise (300 fpm rate of climb) ceilings.

**EXAMPLE**

For time to climb (figure 1A4-1) enter chart with gross weight and density altitude at start of climb (A). Parallel guide line to density altitude at end of climb (B). Read across to find time to climb in minutes (C). Gross weight at end of climb may be found by reading across from density altitude at end of climb (B) parallel to fuel lines to fuel used in climb (D) and subtracting this weight from gross weight at start of climb. For distance and fuel (figure 1A4-2) follow same procedure as for time to climb and read distance in climb (nautical miles) to the left. Follow guide lines to the right from

density altitude at end of climb and read total fuel used in climb.

### **METO POWER CLIMB**

METO power climb performance is presented in two climb curves (figures 1A4-3 and 1A4-4). One presents time and speed. The other presents distance and fuel consumed. Airspeeds shown (IAS vs density altitude) are the same for both charts. The data are plotted in a convenient form against weight and guide lines representing the weight variation during a steady climb. The data are based upon climb at METO power, standard atmosphere with flaps and gear up. The METO power schedule shows power settings to be used. The charts are used in the same manner as the operational climb charts.

### **CEILING — ONE ENGINE INOPERATIVE**

Absolute and service ceilings of the airplane at various weights with METO power under standard conditions are presented in figure 1A4-5. The chart can be used to find terrain clearance if an engine should fail enroute. Single-engine drift-down altitude can also be determined by these charts. The gross

weight refer to the gross weight of the airplane at the time of engine failure.

### **DRIFT-DOWN**

If an engine fails during flight at altitudes above single-engine ceiling, the airplane will drift down; i. e., lose altitude at a decreasing rate until stabilized flight is attained at the absolute ceiling for the power and instantaneous weight conditions. Drift-down performance is presented in figure 1A4-6. For best results, operate the remaining engine at METO power and fly the airplane at recommended speed for weight shown on the chart. In cases of emergency at lower altitudes, the use of military power (2800 rpm) for a limited time will reduce the altitude loss. To use the chart, enter with the airplane gross weight at the time of engine failure (A). Proceed vertically to the initial altitude (B). Read the distance traveled during drift-down on the right-hand scale (C). From the initial altitude, parallel the guide lines down to the gross weight scale (D) and read the airplane gross weight at the end of drift-down (final gross weight). With this weight, enter the final gross weight scale in the upper left corner (E). Proceed vertically down to the drift-down curve, then horizontally to the final altitude scale (F).

MODEL: T-29A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

OPERATIONAL CLIMB - TIME TO CLIMB AND FUEL CONSUMED

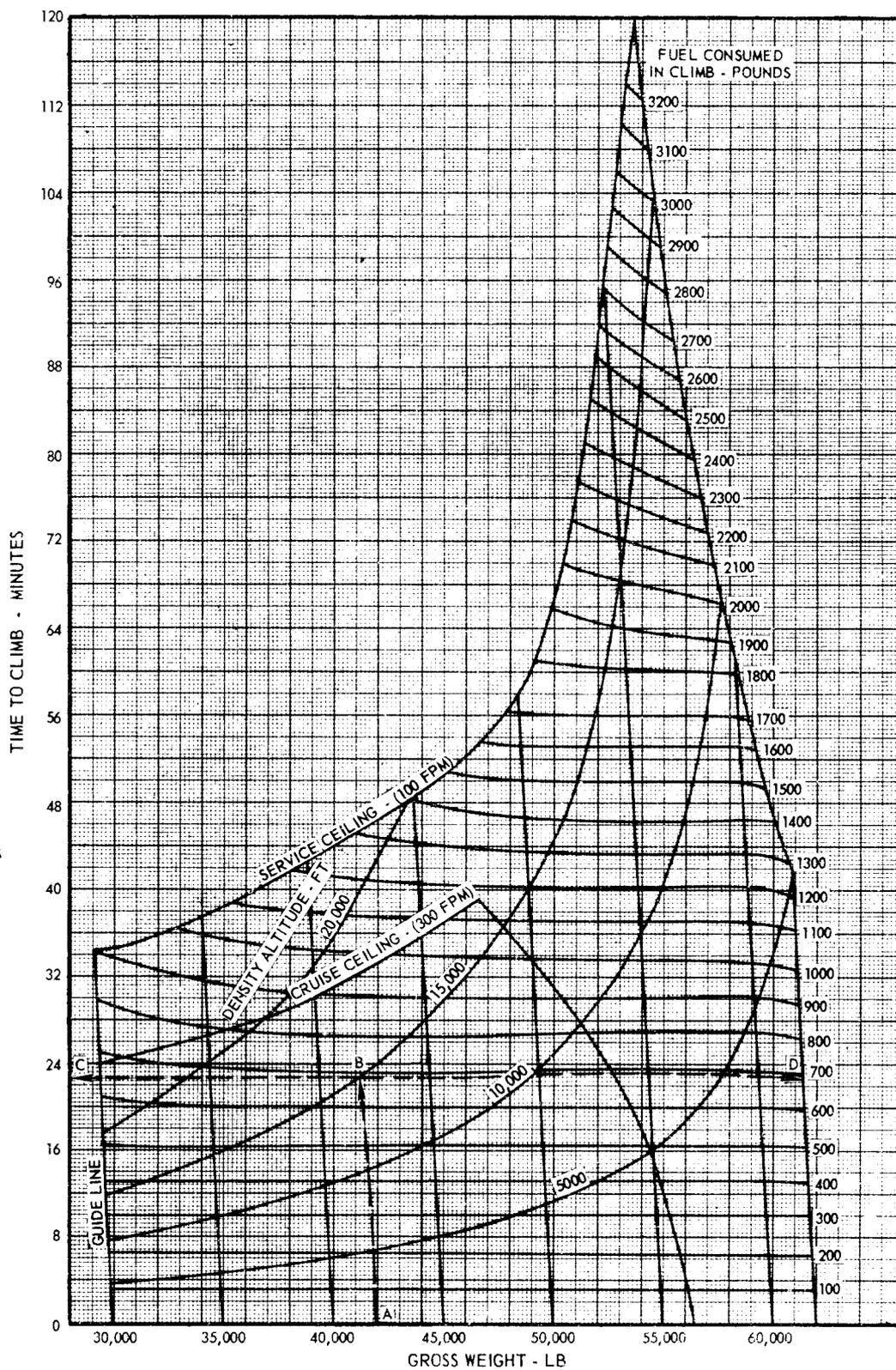
1400 BHP ENG

2400 RPM

ENGINES: R2800-97

NOTES:

- (1) CLIMB SPEED = 140 KNOTS IAS
- (2) NACELLE FLAPS MID POSITION
- (3) AUTO-RICH MIXTURE

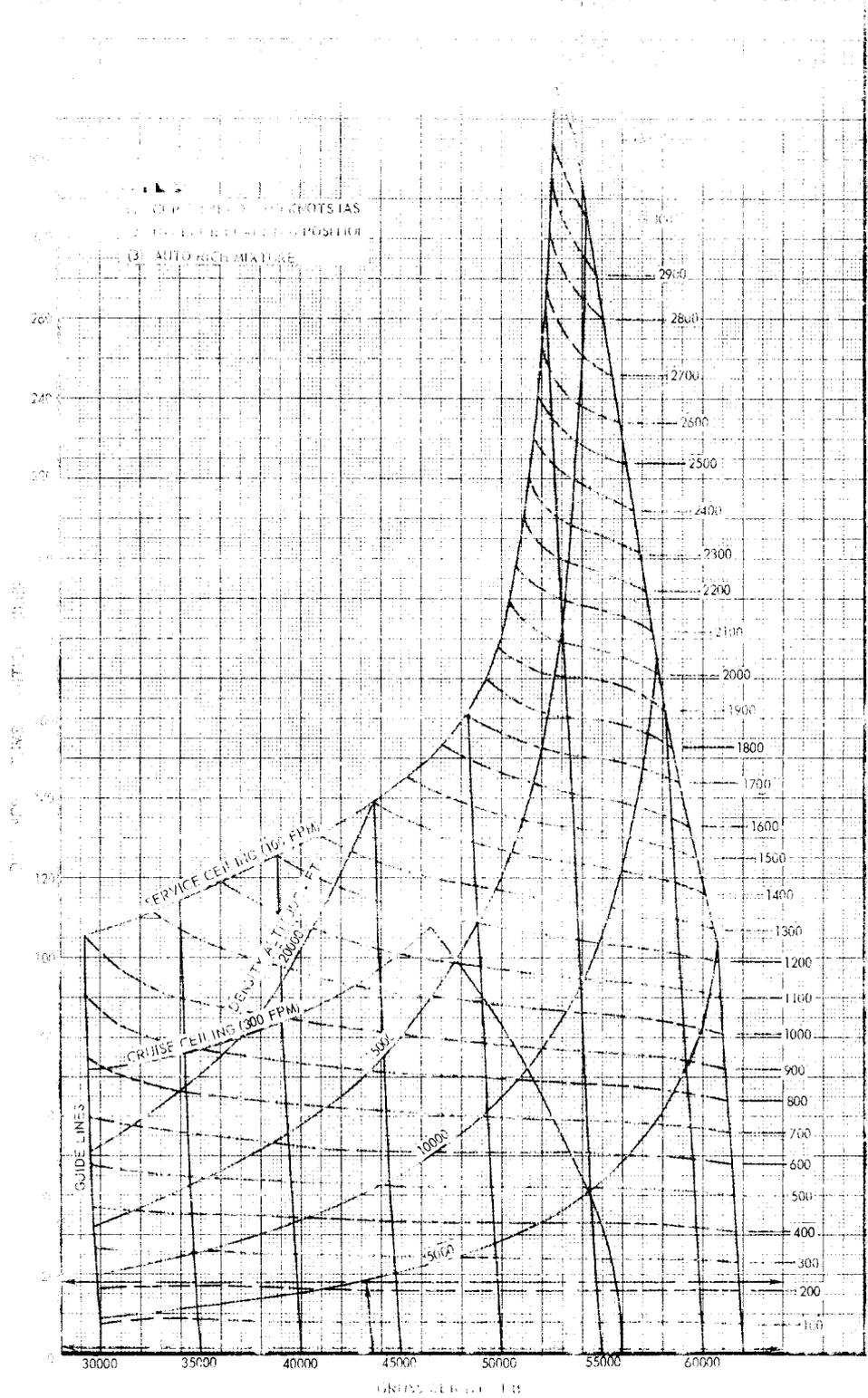


10.730C

Figure 1A4-i

MODEL T  
DATE: 10  
DATA BASE:

R2800-97

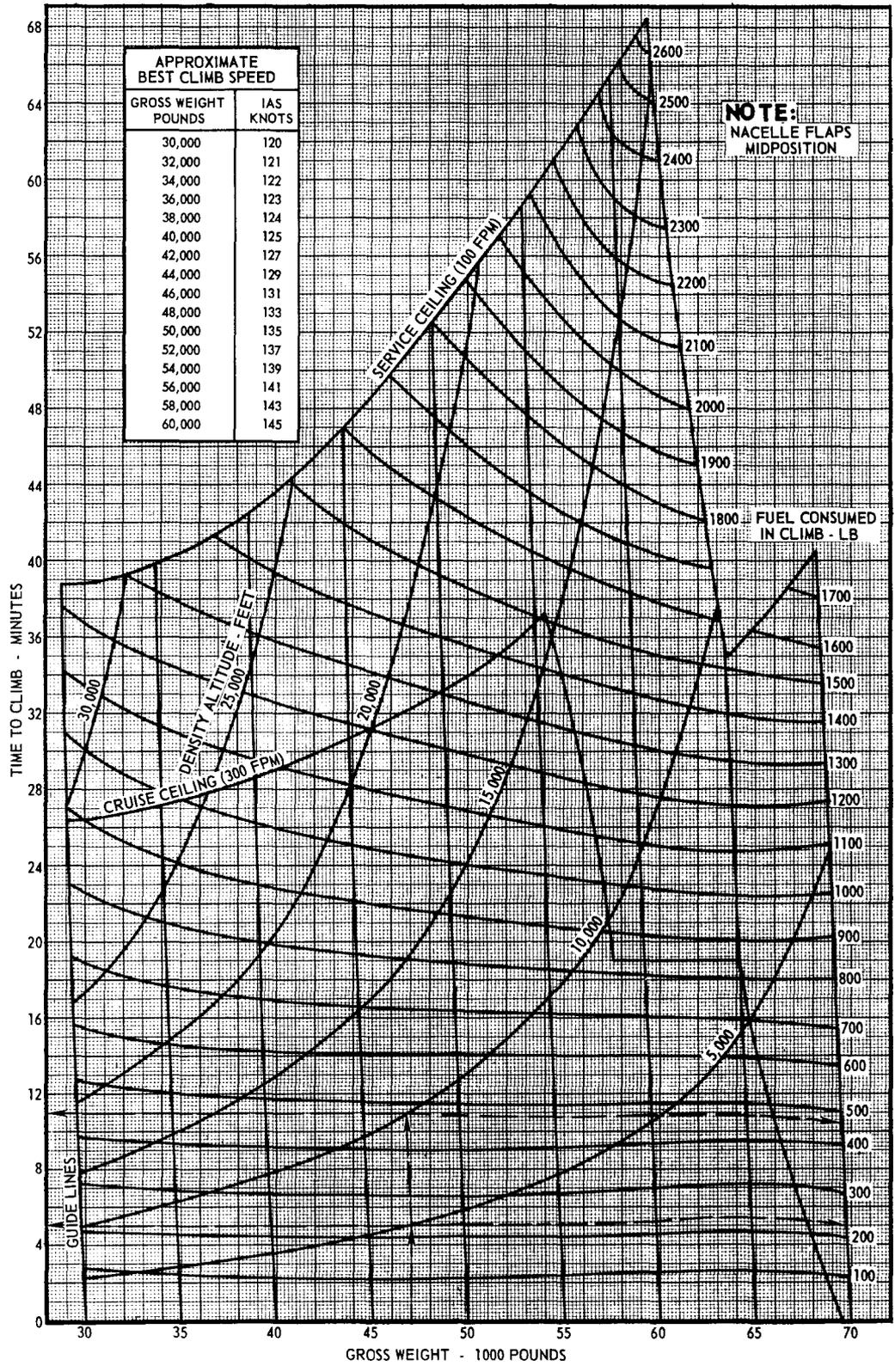


MODEL: T-29A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

METO POWER CLIMB - TIME AND SPEED

CLEAN CONFIGURATION

ENGINES: R2800 - 97



10,753B

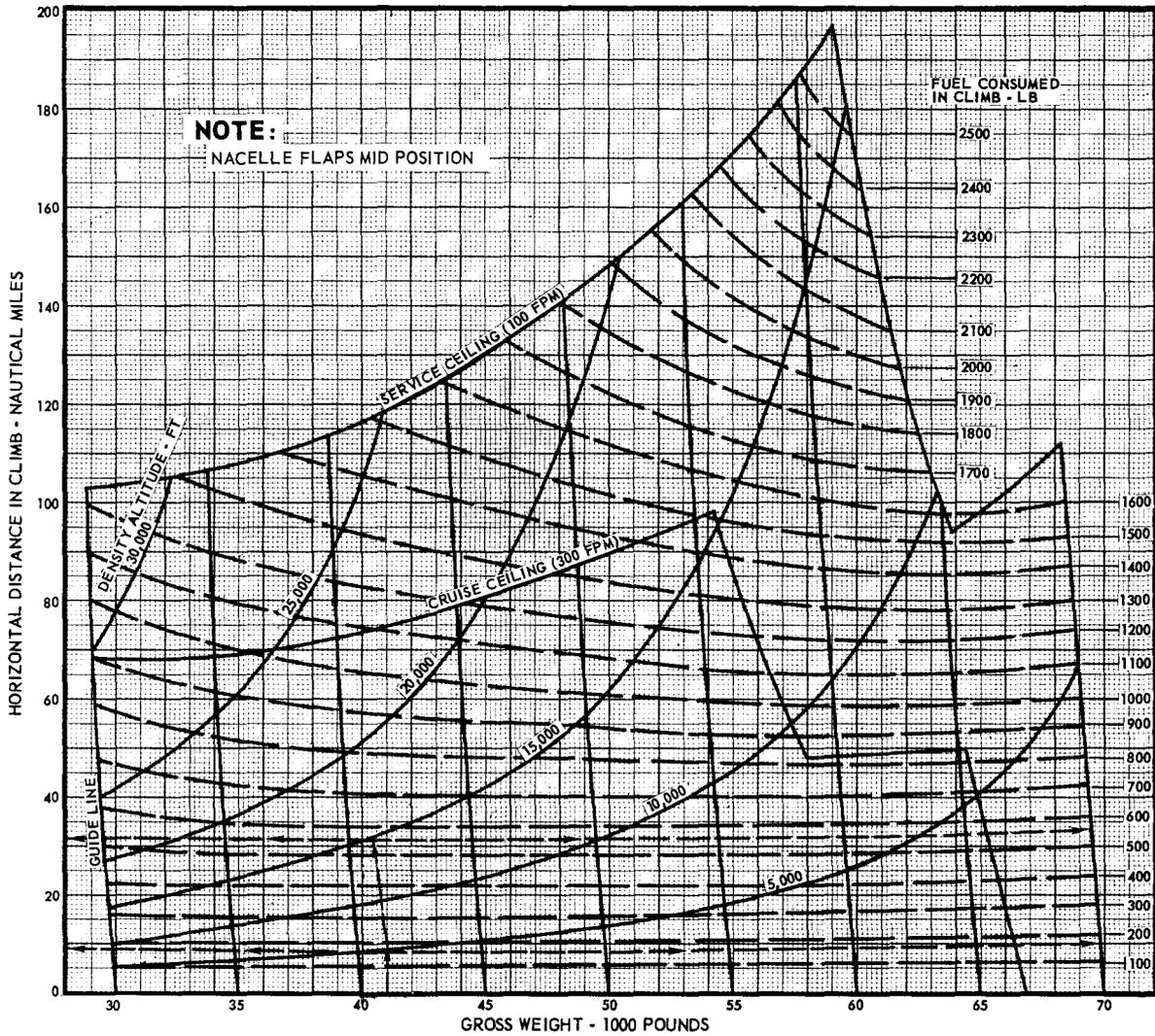
Figure 1A4-3

MODEL: T-29A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

### METO POWER CLIMB - DISTANCE AND FUEL

CLEAN CONFIGURATION

ENGINES: R2800-97



10,754A

Figure 1A4-4

MODEL: T-29A/B

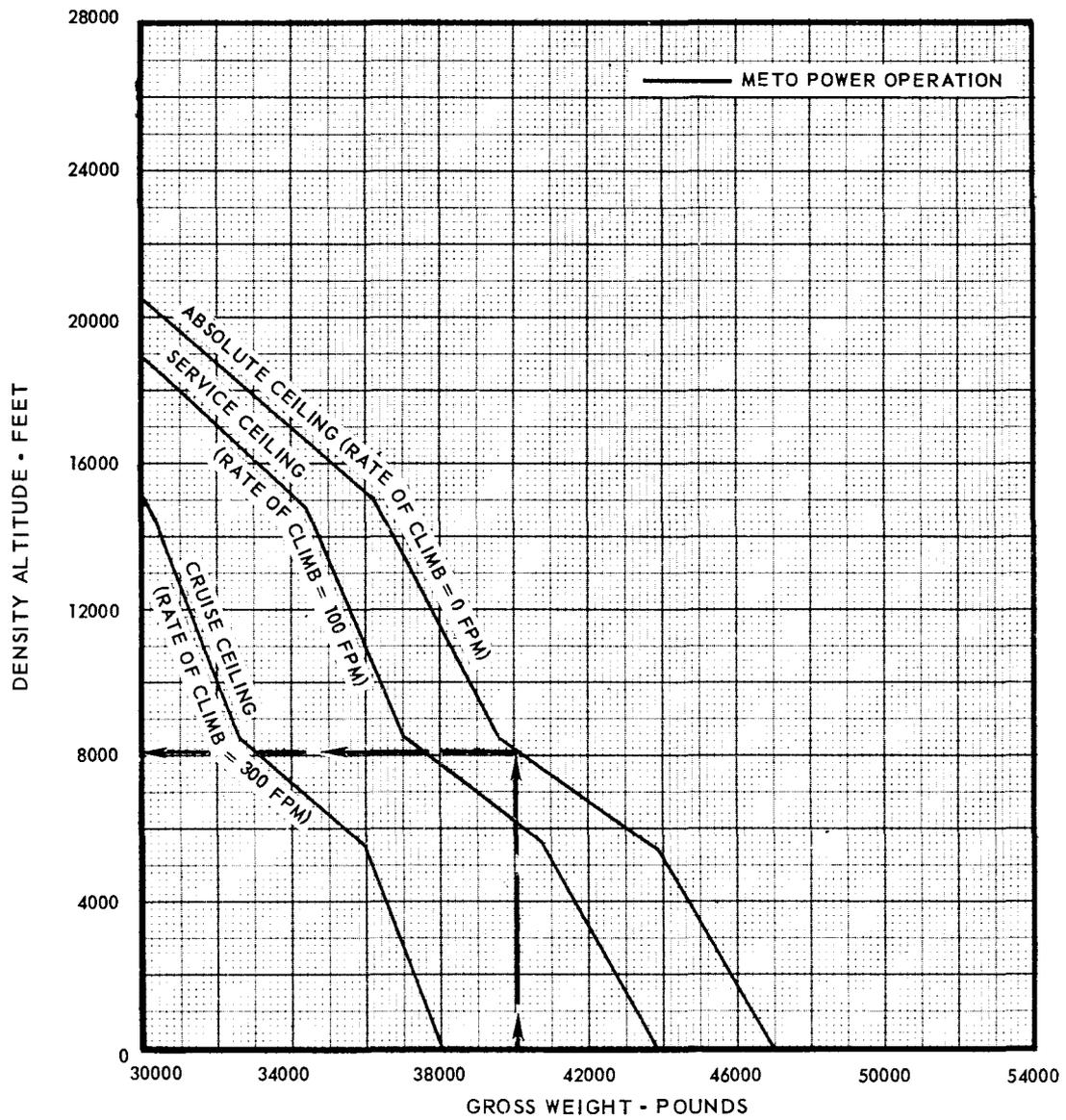
DATE: 15 JULY 1955

DATA BASIS: FLIGHT TEST

### CEILING - ONE ENGINE INOPERATIVE

STANDARD ATMOSPHERE CLEAN CONFIGURATION

ENGINES: R2800-97



10,742A

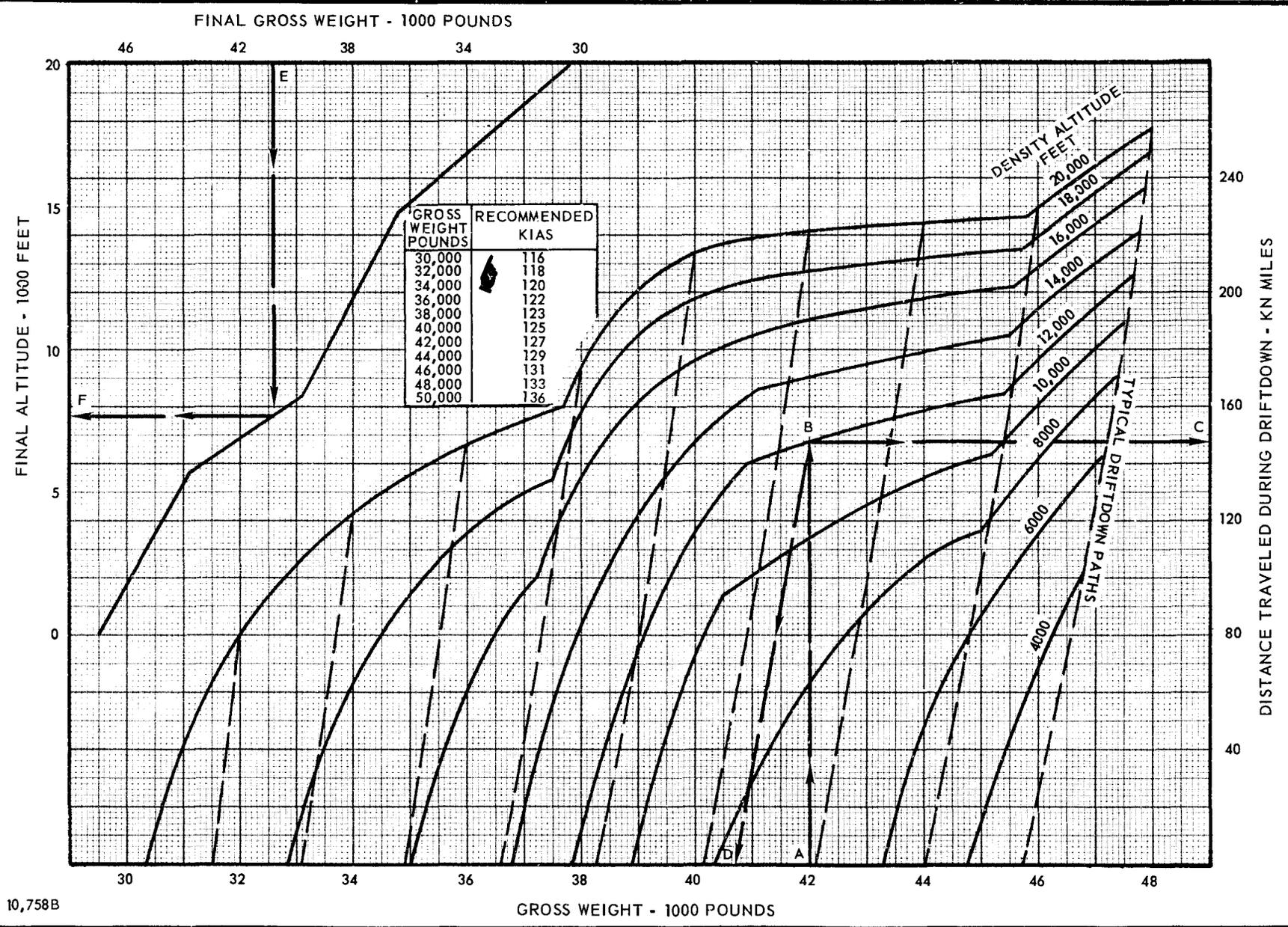
Figure 1A4-5

### DRIFTDOWN - ONE ENGINE INOPERATIVE

METO POWER

MODEL: T-29 A/B  
DATE: 15 MARCH 1955  
DATA BASIS: FLIGHT TEST

ENGINES: R 2800-97



1A4-8

Change 2

Figure 1A4-6

**PART 5 – CRUISE**

**A B**

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*MAXIMUM ENDURANCE SUMMARY . . . . .	1A5-8
*LONG RANGE PREDICTION - DISTANCE . . . . .	1A5-9
*LONG RANGE PREDICTION - TIME . . . . .	1A5-10
*NAUTICAL MILES PER POUND OF FUEL - ONE ENGINE INOPERATIVE - SEA LEVEL/15,000 FEET . . . . .	1A5-11

The symbol \* indicates an illustration

**CRUISE CONTROL**

Cruise performance as used in this Appendix is defined as being that portion of flight wherein the altitude is held constant, i. e., level flight. The speeds and powers used are selected to maintain this position. Data are shown to determine this relationship between speed and power throughout the usable range of the airplane. Power is shown as BHP per engine. Reference to the power schedules will show the necessary power settings of MAP, TPSI and rpm to deliver this BHP per engine.

**NAUTICAL MILES PER POUND OF FUEL**

Nautical miles per pound of fuel curves (figures 1A5-1 through 1A5-5) are presented for several density altitudes from sea level to the maximum usable altitude of the airplane in increments of 5000 feet. The data are based upon fuel flow expected when mixture controls are in the specified automatic settings. The nautical miles per pound of fuel curves are applicable in any non-standard conditions where the powers shown may be obtained. To simplify selections of speed and power for long-range cruising, three curves are shown to represent the powers and speeds to be selected for flight in wind conditions, for 50-knot tailwind, zero wind and 50-knot headwind. Wind values between these lines can be interpolated. The following examples show the various methods of using these charts:

**EXAMPLE 1.** Determine power and speed for long range cruise.

Given:

Density altitude = 10,000 feet.

Gross weight at start of cruise = 42,000 pounds.

Gross weight at end of cruise = 38,000 pounds.

Enter chart (figure 1A5-3) at weight at start of cruise 42,000 pounds. Follow weight line to intersection of long range line (no wind) and find 1000 bhp at start of cruise. Proceed vertically to read calibrated airspeed of 155 knots at start of cruise. Repeat the procedure with gross weight at end of cruise to find 930 bhp and 153 knots CAS at end of cruise.

**Note**

This cruise procedure requires changes in power and airspeed to maintain long-range conditions. An alternate method would be to use an average gross weight for cruise and fly at a constant power and airspeed for that weight.

**EXAMPLE 2.** Determine distance, fuel used, and airspeed for two-hour cruise at 1000 bhp.

**Note**

Since it is desired to cruise at 1000 bhp for two hours, a sufficiently accurate estimate may be made of the fuel flow by reading nautical miles per pound of fuel value and a true airspeed value at an assumed average weight and dividing the true airspeed by the air nautical miles per pound of fuel ( $n \text{ mi/hr} \div n \text{ mi/lb} = \text{lb/hr}$ ).

Using same altitude and weight as Example 1 and assuming a fuel flow of 900 pounds per hour, then average weight for two-hour cruise is  $42,000 - 900 = 41,100$  pounds. Enter chart (figure 1A5-3) at average cruise weight and follow weight lines to intersection of 1000 bhp. Proceed vertically to find TAS of 183 knots. Proceed horizontally from weight and power intersection to find 0.217 air nautical miles per pound. Then fuel used is  $183 \div 0.217 = 845$  pounds per hour.

**Note**

The fuel used figure of 845 pounds is close enough to the assumed value of 900 pounds. If it were substantially different, another estimate should be made.

Weight at end of two-hour cruise is  $42,000 - 1690 = 40,310$  pounds. Distance in two-hour cruise is  $183 \text{ knots} \times 2 \text{ hours} = 366$  nautical miles.

**EXAMPLE 3.** Interpolation for intermediate altitudes.

Given:

Density altitude = 8000 feet.

Gross weight at start of cruise = 42,000 pounds.

Power and speed for long range cruise at 8000 feet can be determined by interpolation between 5000 feet and 10,000 feet. In Example 1, the power and speed for 42,000 pounds and 10,000 feet were found to be 1000 bhp and 155 knots CAS. Using the same procedure with the chart for 5000 feet (figure 1A5-3), the power and speed are found to be 930 bhp and 159 knots CAS. The difference between 1000 bhp and 930 bhp is 70 bhp for 5000 feet difference in altitude. Find the difference in BHP for 3000 feet by the following ratio:

$$\frac{\text{BHP}}{70} = \frac{3}{5}$$

$$\text{BHP} = \frac{3 \times 70}{5} = 42$$

Then BHP for 8000 feet is  $930 + 42 = 972$  bhp. Note that the difference in calibrated airspeed is approximately 1 knot per 1000 feet. The airspeed for 8000 feet is 156 knots.

**MAXIMUM ENDURANCE**

Data from the nautical miles per pound of fuel curves have been replotted in the Maximum Endurance Chart (figure 1A5-6) for convenient determination of recommended minimum power and speed. The data show BHP/ENG, speed, and resulting fuel flow for gross weight and density altitude.

**LONG RANGE PREDICTION**

The long range prediction curves (figures 1A5-7 and 1A5-8) present the distance and time as fuel is used during cruise.

**EXAMPLE**

Given:

Weight at start of cruise = 43,300 pounds.

Density altitude = 5000 feet.

Cruise distance = 340 nautical miles.

Enter chart (figure 1A5-7) at gross weight 43,300 pounds (A) and read up to density altitude 5000 feet (B). Read across to distance and read 2500 nautical miles (C). Add the cruise distance ( $2500 + 340 = 2840$ ) and re-enter chart at 2840 nautical miles (D). Read across to 5000 feet density altitude (E) and down to find gross weight at end of cruise 41,800 pounds (F). The difference between the weight at start of cruise and the weight at end of cruise ( $43,300 - 41,800 = 1500$ ) is the weight of fuel used for 340 nautical miles cruise at CAS for long range. CAS is obtained from the applicable nautical miles per pound of fuel chart. Determination of time for cruise is done by the same procedure with the long range prediction time curve (figure 1A5-8).

**Note**

These charts can also be used to find the distance traveled and the elapsed time for any given amount of fuel used. Enter the chart at the gross weight at start of cruise and at end of cruise. Extend lines from these two points up to the density altitude line, then across to the distance at altitude scale. The difference between the two points of distance is the distance traveled.

**CRUISE CONTROL—ONE ENGINE INOPERATIVE**

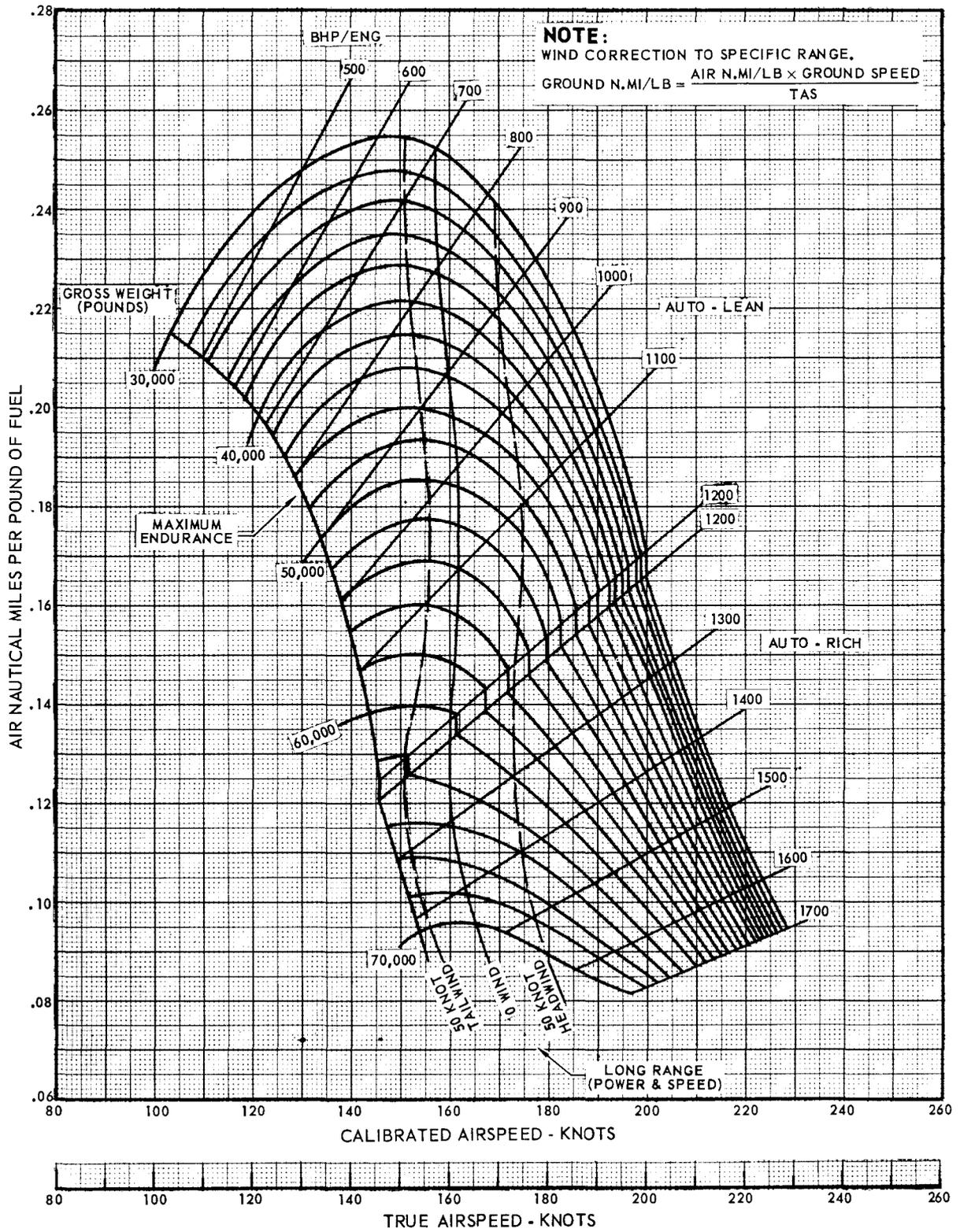
Nautical miles per pound of fuel data similar to that presented for normal cruise is presented for cruise with one engine inoperative, propeller feathered (figures 1A5-9 through 1A5-12). It is important that the propeller be feathered; if it is allowed to wind-mill, a serious reduction in range will result.

MODEL: T-29A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

### NAUTICAL MILES PER POUND OF FUEL - SEA LEVEL

TWO ENGINE CRUISE      LOW BLOWER      STANDARD ATMOSPHERE

ENGINES: R2800-97



10,774A

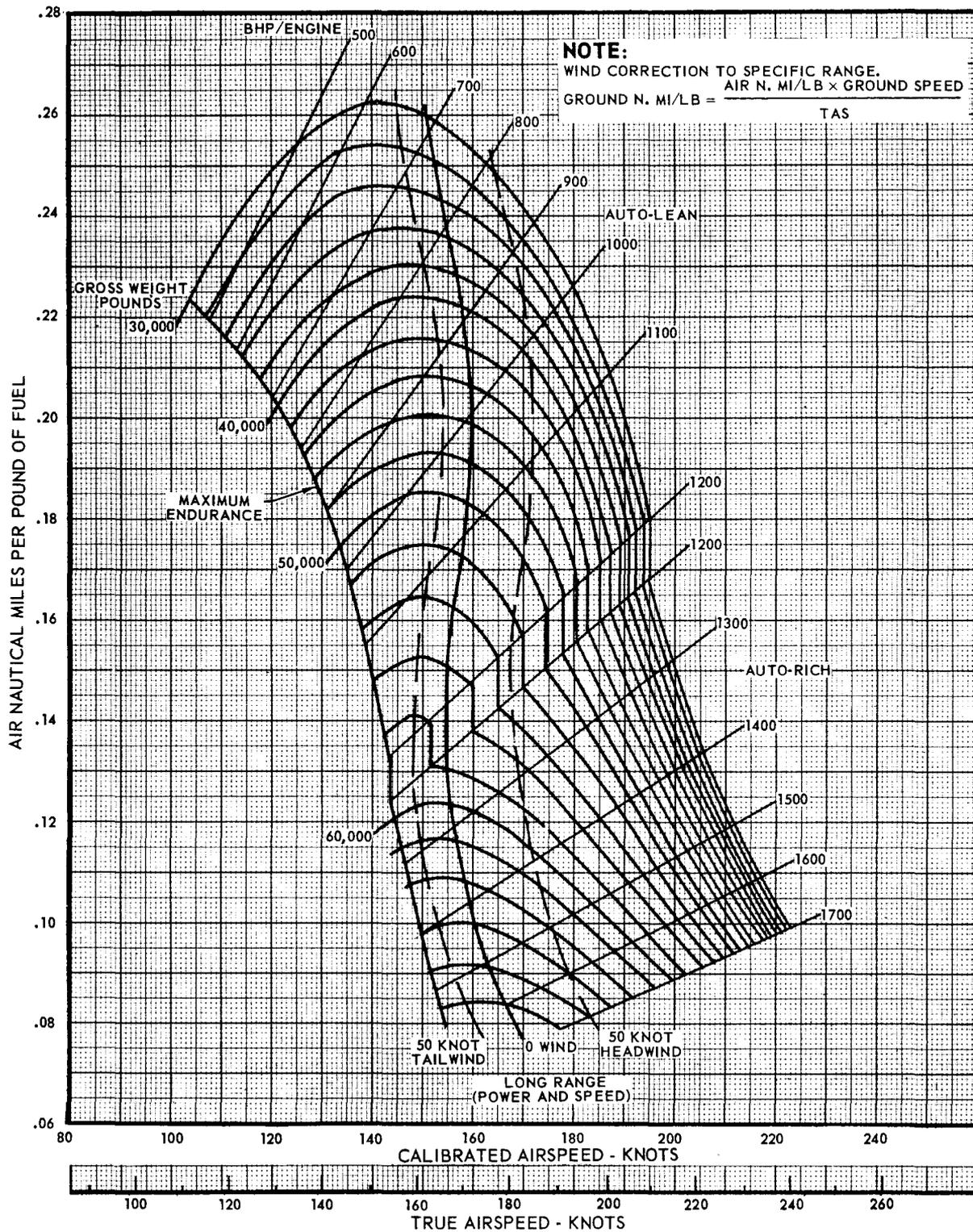
Figure 1A5-1

**NAUTICAL MILES PER POUND OF FUEL - 5000 FEET**

MODEL: **T-29 A/B**  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

TWO ENGINE CRUISE      LOW BLOWER      STANDARD ATMOSPHERE

ENGINES: R2800 - 97



10,775A

Figure 1A5-2

MODEL: T-29A/B

DATE: 15 JULY 1955

DATA BASIS: FLIGHT TEST

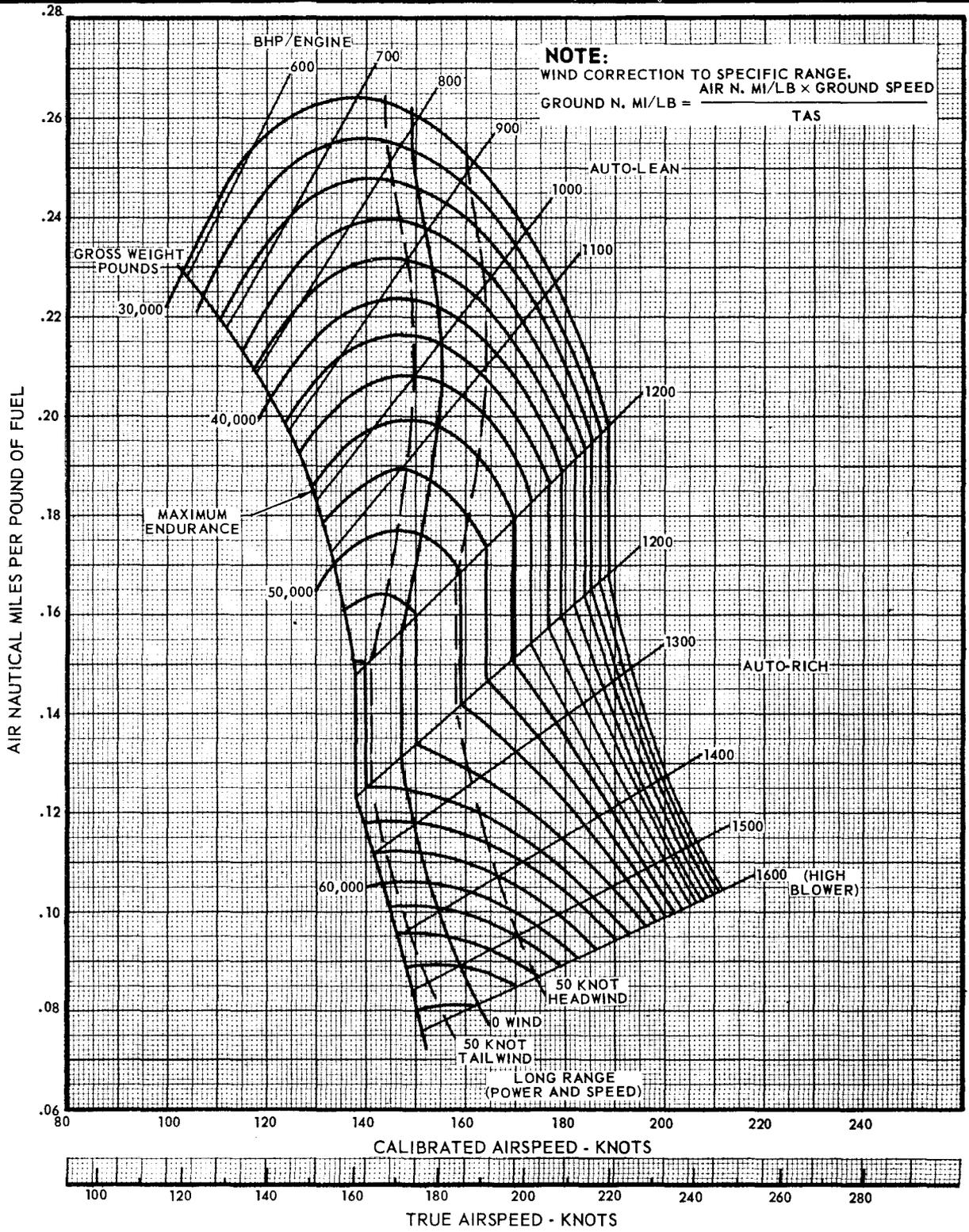
### NAUTICAL MILES PER POUND OF FUEL - 10,000 FEET

TWO ENGINE CRUISE

LOW BLOWER

STANDARD ATMOSPHERE

ENGINES: R2800-97



10,776A

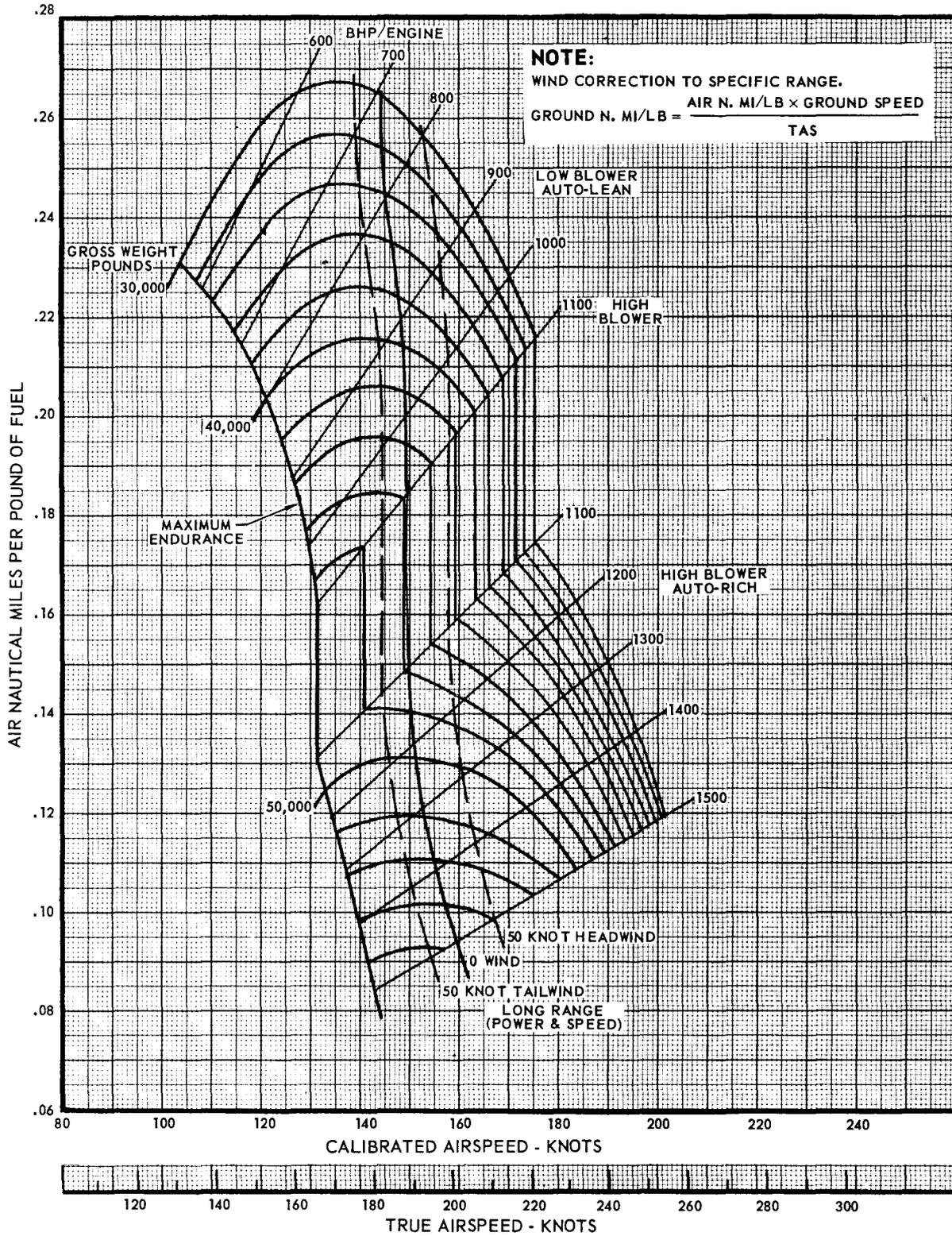
Figure 1A5-3

NAUTICAL MILES PER POUND OF FUEL - 15,000 FEET

MODEL: T-29A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

TWO ENGINE CRUISE STANDARD ATMOSPHERE

ENGINES: R2800-97



10,777A

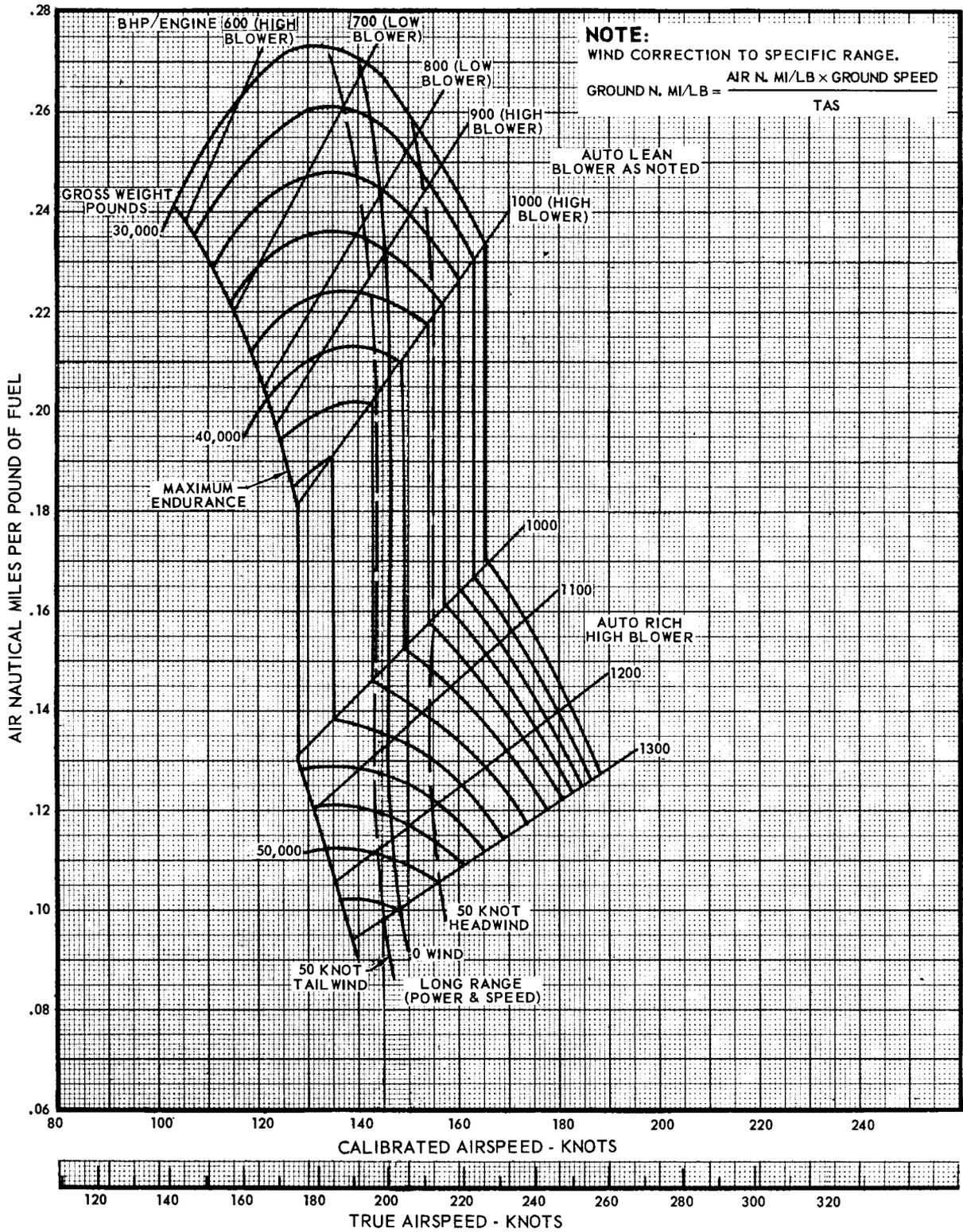
Figure 1A5-4

### NAUTICAL MILES PER POUND OF FUEL - 20,000 FEET

MODEL: T-29 A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

TWO ENGINE CRUISE      STANDARD ATMOSPHERE

ENGINES: R2800-97



10,778A

Figure 1A5-5

MODEL: T - 29 A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

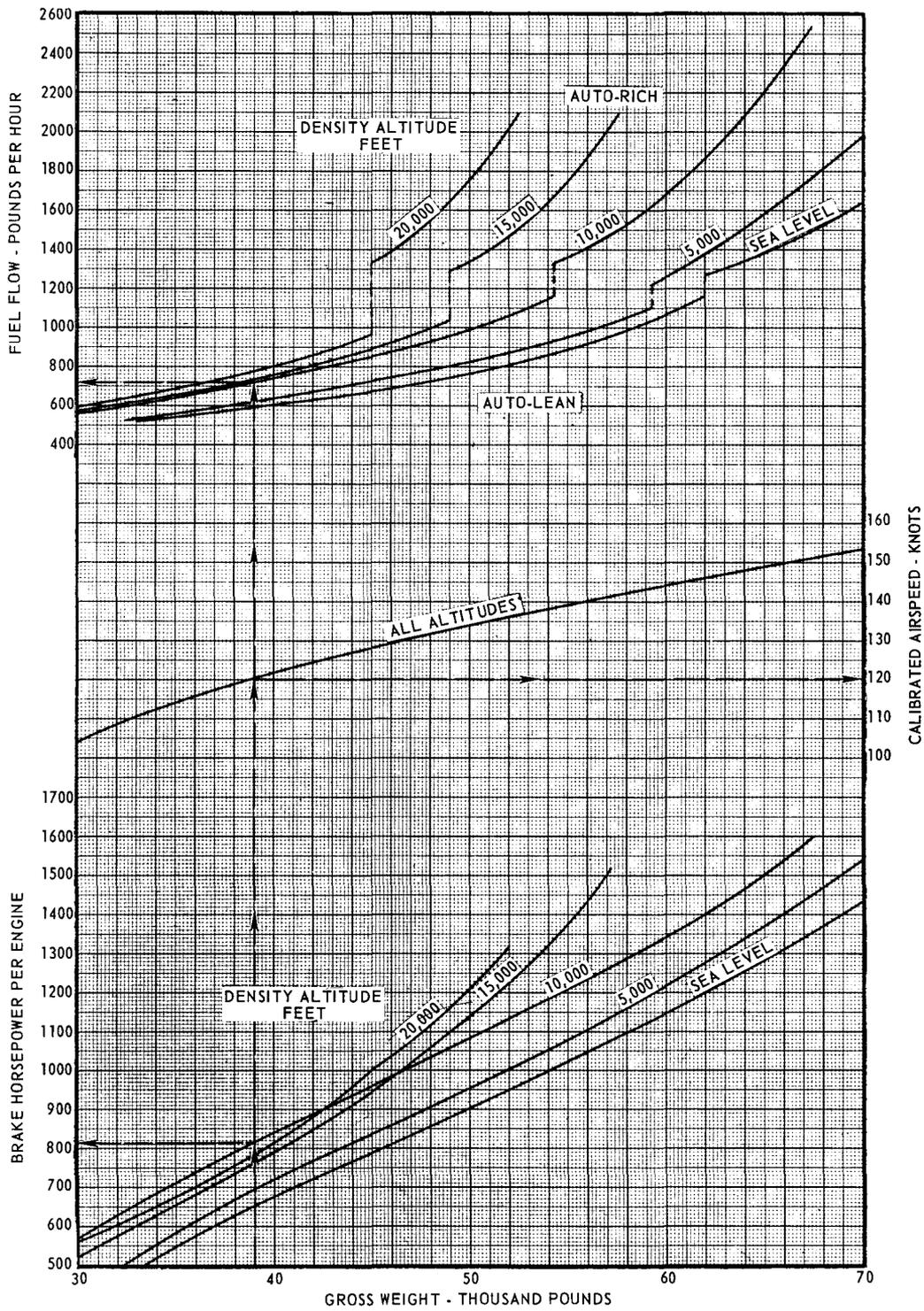
**MAXIMUM ENDURANCE SUMMARY**

TWO ENGINES

STANDARD ATMOSPHERE

CLEAN CONFIGURATION

ENGINES: R2800 - 97



10,780A

Figure 1A5-6

MODEL: T-29A/B

DATE: 15 JULY 1955

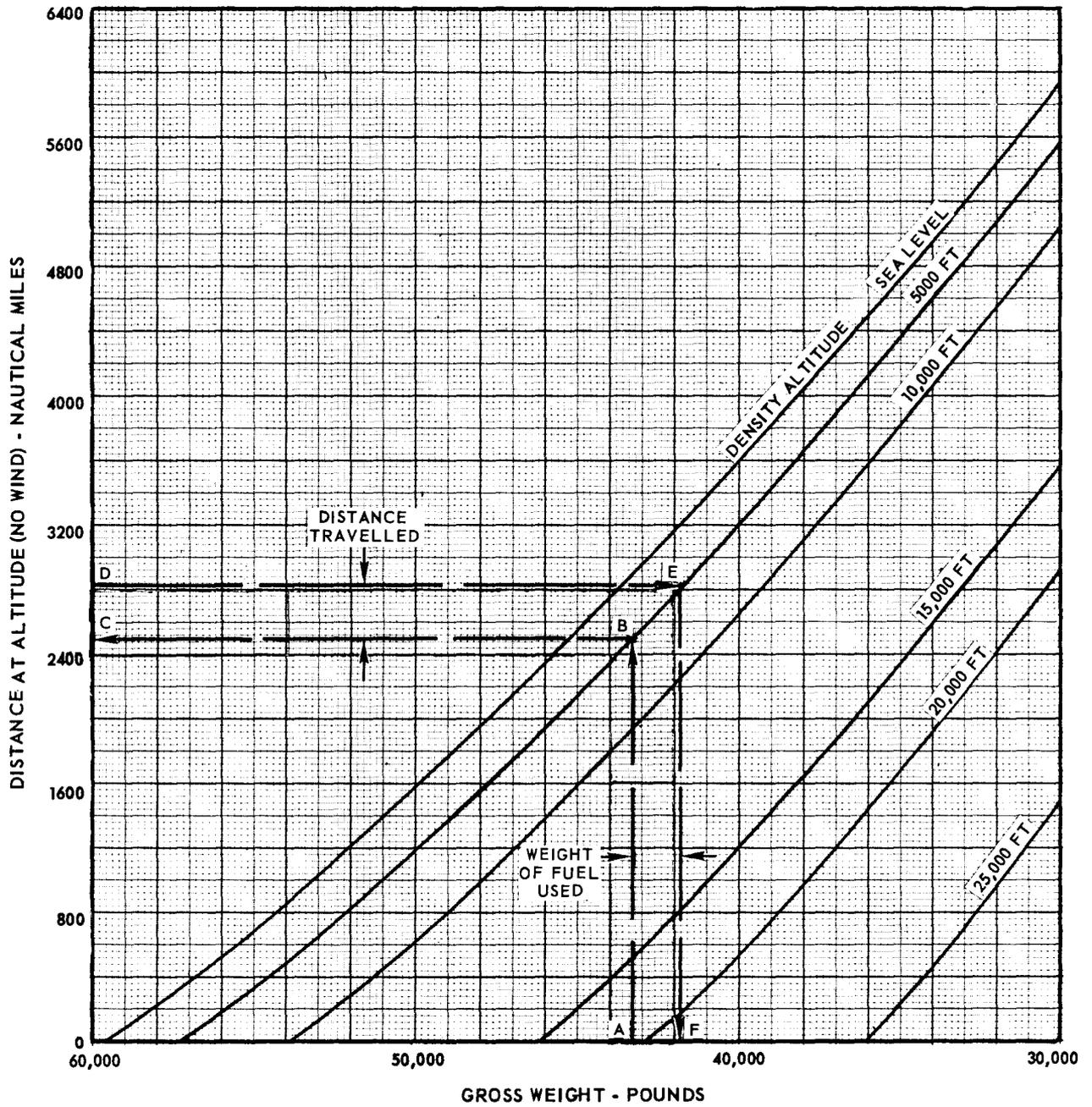
DATA BASIS: FLIGHT TEST

### LONG RANGE PREDICTION - DISTANCE

TWO ENGINE

STANDARD ATMOSPHERE CLEAN CONFIGURATION

ENGINES: R2800-97



10,739A

Figure 1A5-7

MODEL: T-29A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

LONG RANGE PREDICTION - TIME  
TWO ENGINE  
STANDARD ATMOSPHERE CLEAN CONFIGURATION

ENGINES: R2800-97

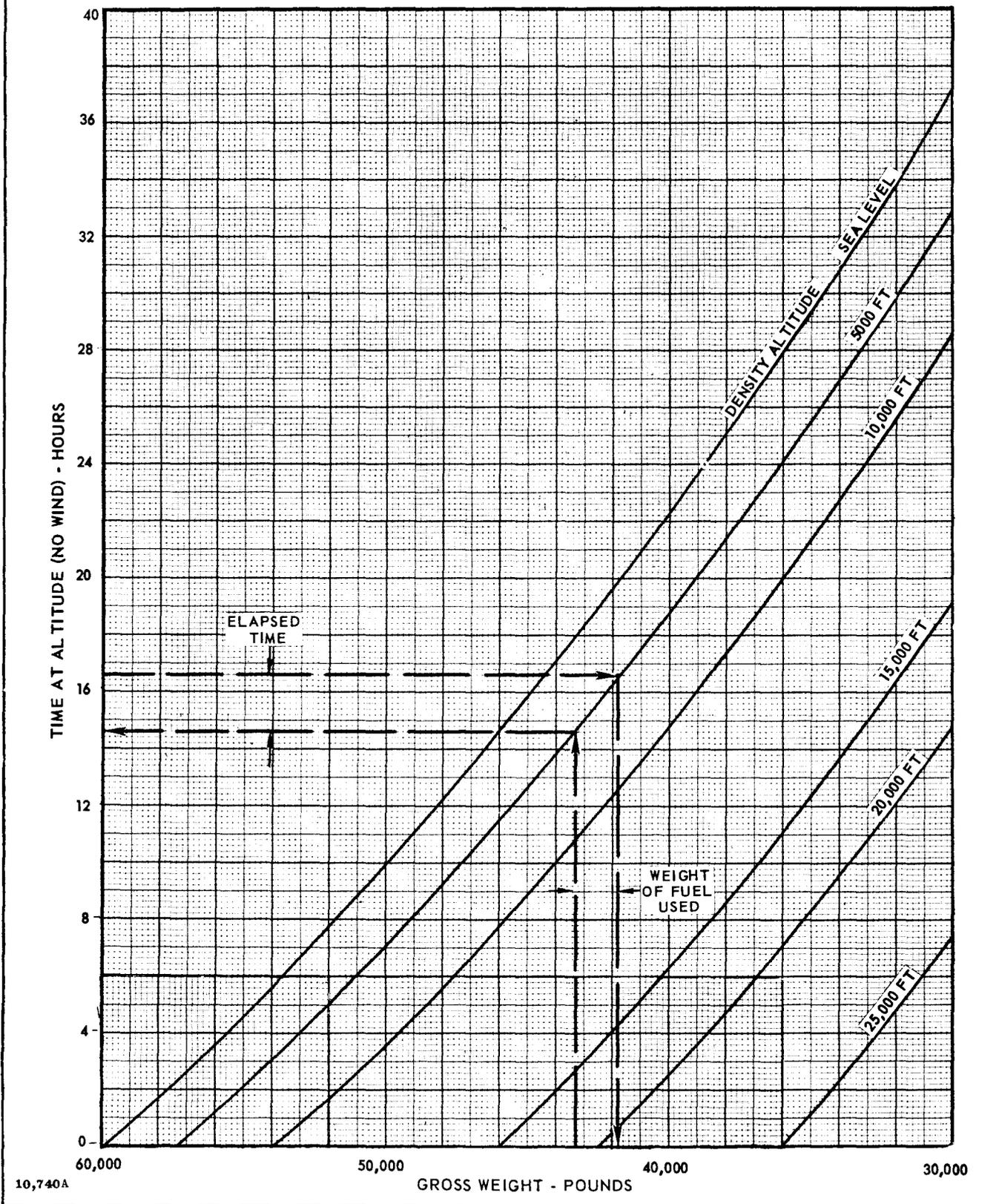
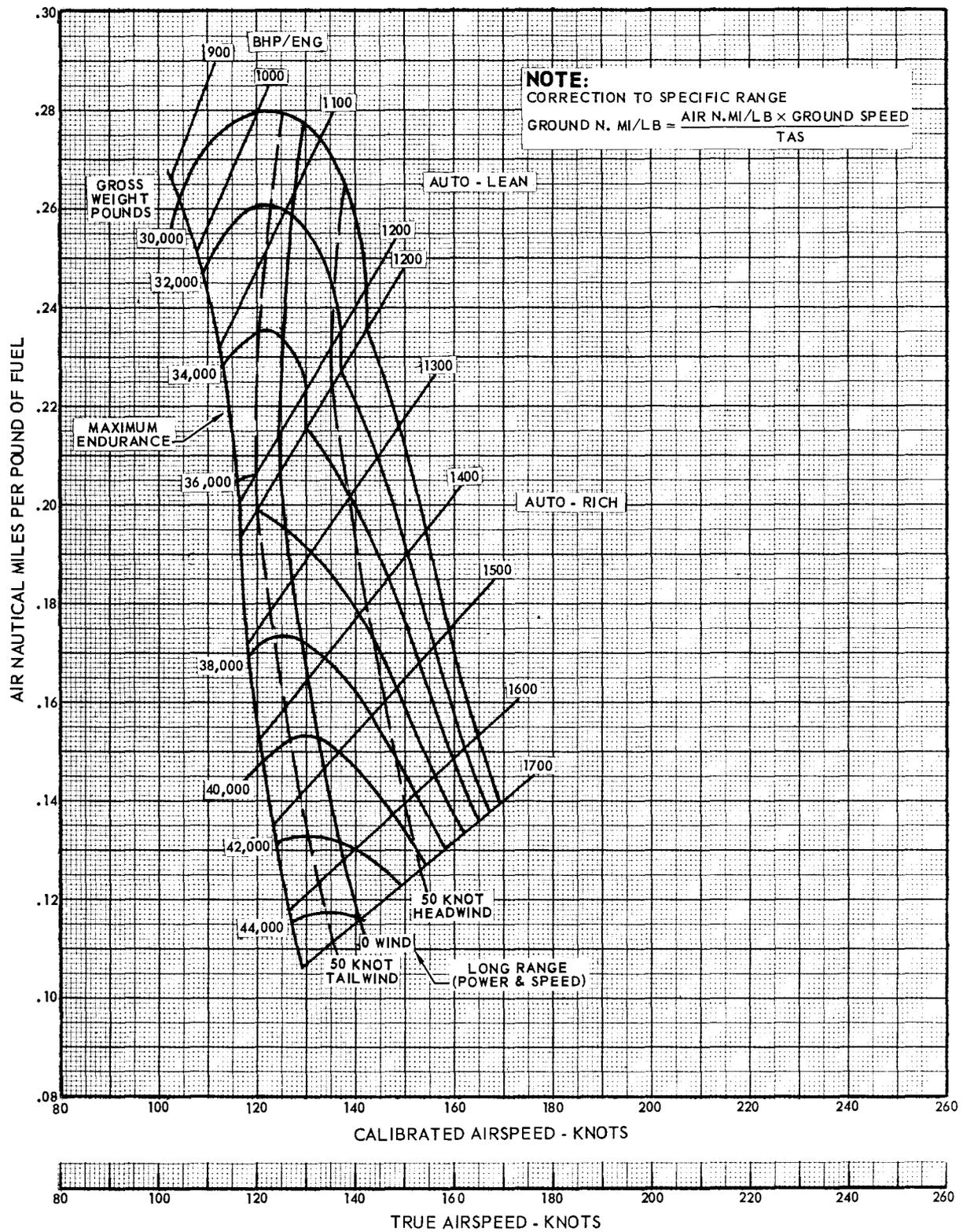


Figure 1A5-8

MODEL: T-29A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

**NAUTICAL MILES PER POUND OF FUEL -  
ONE ENGINE INOPERATIVE - SEA LEVEL**  
PROPELLER FEATHERED LOW BLOWER STANDARD ATMOSPHERE

ENGINES: R2800 - 97



10,781A

Figure 1A5-9

MODEL: T-29A/B

DATE: 15 JULY 1955

DATA BASIS: FLIGHT TEST

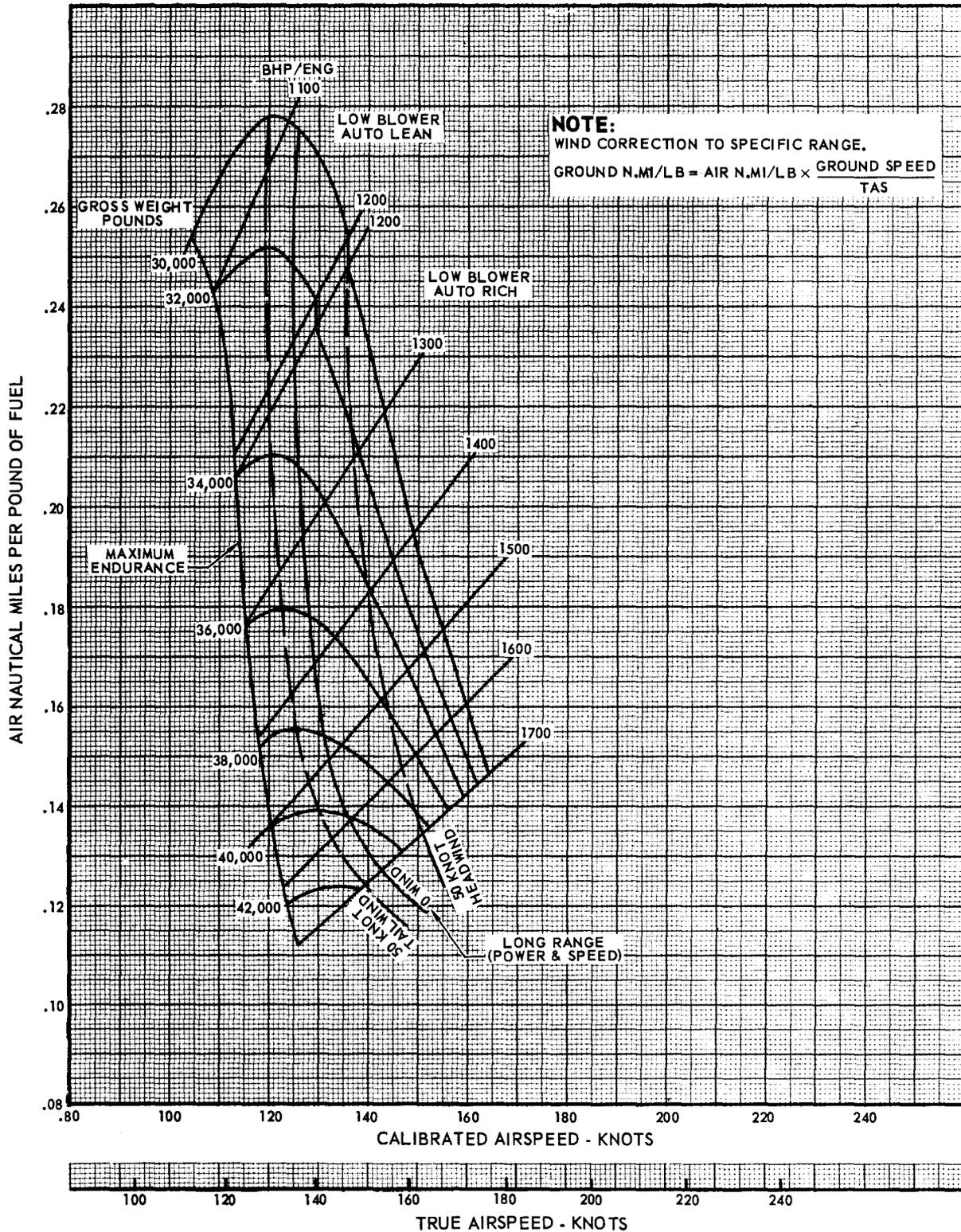
**NAUTICAL MILES PER POUND OF FUEL  
ONE ENGINE INOPERATIVE - 5000 FEET**

PROPELLER FEATHERED

STANDARD ATMOSPHERE

LOW BLOWER

ENGINES: R2800 - 97



10,782

Figure 1A5-10

### NAUTICAL MILES PER POUND OF FUEL ONE ENGINE INOPERATIVE - 10,000 FEET

MODEL: T-29A/B

PROPELLER FEATHERED

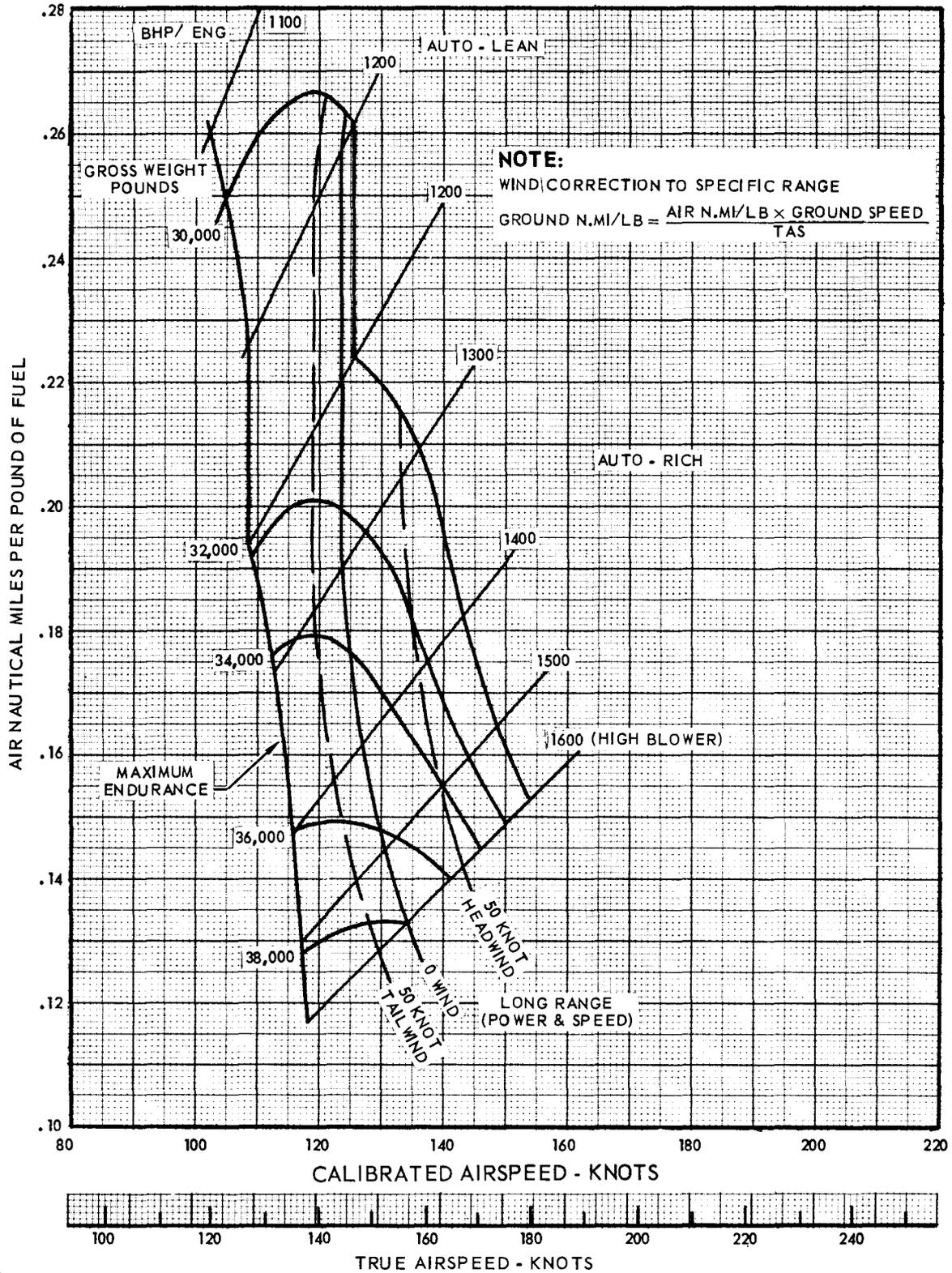
LOW BLOWER

STANDARD ATMOSPHERE

DATE: 15 JULY 1955

DATA BASIS: FLIGHT TEST

ENGINES: R2800-97

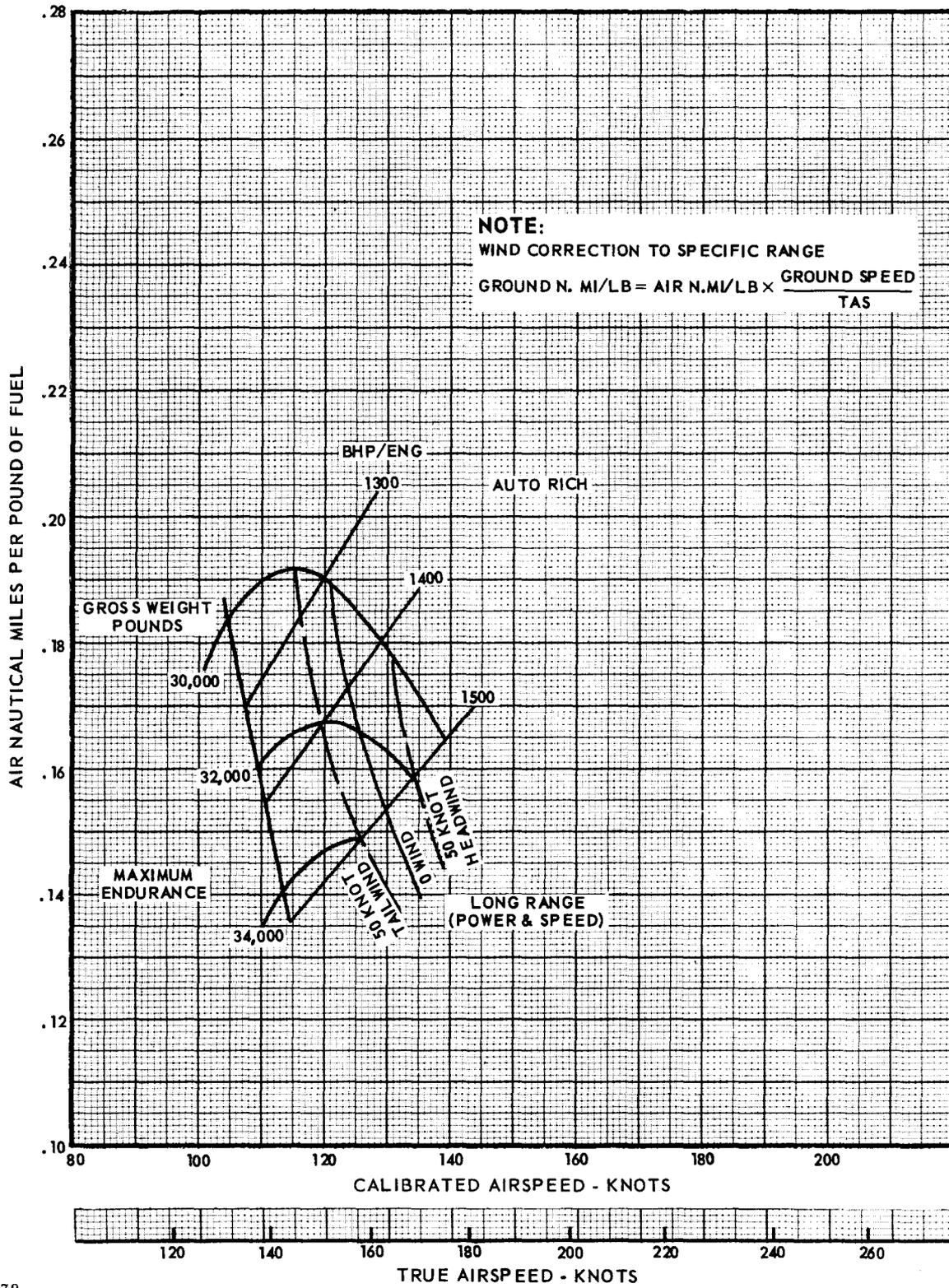


10,783A

Figure 1A5-11

MODEL: T-29 A/B  
DATE: 15 JULY 1955  
DATA BASIS: FLIGHT TEST

**NAUTICAL MILES PER POUND OF FUEL**  
**ONE ENGINE INOPERATIVE - 15,000 FEET**  
PROPELLER FEATHERED STANDARD ATMOSPHERE HIGH BLOWER ENGINES: R2800-97



10,779

Figure 1A5-12

**PART 6 – APPROACH AND LANDING**

**A B**

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*APPROACH AND LANDING SPEEDS . . . . .	1A6-3
*LANDING GROUND ROLL (39° FLAP). . . . .	1A6-4
*LANDING GROUND ROLL (28° FLAP). . . . .	1A6-5
*LANDING GROUND ROLL (20° FLAP). . . . .	1A6-6
*LANDING GROUND ROLL (15° FLAP). . . . .	1A6-7
*LANDING GROUND ROLL (0° FLAP) . . . . .	1A6-8
*STOPPING CAPABILITY CHART . . . . .	1A6-9

The symbol \* indicates an illustration

**APPROACH AND LANDING**

Extending the flaps decreases the landing speed and decreases the landing field length. Wing flaps should not be extended to the landing position until the landing is assured. In normal flight planning, the greater of the available landing wing flap settings (39°, 28°, 20°, 15° and 0°) should be considered first. Specifically note that for each of the landing flap settings there is a corresponding approach flap setting. The selection of the landing flap setting should be based on the ability of the corresponding approach flap setting to assure adequate single-engine climb performance in the approach configuration in the event of a go-around or the need to lengthen the approach flight path. The recommended approach speeds are based on 130% of power-off stall speeds; touchdown at 120% of stall speed.

**Note**

The approach speeds shown on the charts are indicated airspeeds. Because of position error in the pitot system at the low speeds being used, the indicated approach speeds do not bear a direct relationship to the indicated stall speeds as shown in the Power-Off Stall Speed Chart in Section VI. To correctly calculate the approach and touchdown speeds, it is necessary to convert the indicated stall speed to calibrated airspeed. Using the Airspeed Calibration Chart, multiply by 1.2 or 1.3, and then reconvert the resultant speed to indicated airspeed.

Benefits derived from the brakes are maximum at the lower speeds and minimum at the higher speeds or just after touchdown. Unnecessary use of the

brakes greatly reduces their life. Therefore, the landing distance required, as determined from the Appendix data, should be compared to the available runway length. Only in cases where the landing distance required equals the available field length should a minimum roll landing be made. When the available runway length is greater than the calculated minimum landing distance, as determined from the charts, the airplane can be stopped with less than maximum braking.

**DISCUSSION OF CHARTS**

**Note**

See landing pattern diagram, Section II.

**APPROACH AND LANDING SPEEDS CHART**

The recommended airspeeds for maneuver (1.4V<sub>S</sub>), approach (1.3V<sub>S</sub>), and touchdown (1.2V<sub>S</sub>) with landing gear down may be determined from the Approach and Landing Speeds Chart (figure 1A6-1). The chart is presented for the gross weight and flap setting operating range of the airplane. Power-off stall speeds are included on the chart.

**EXAMPLE**

Given:

Gross weight = 38,000 pounds.

Flap setting – Approach = 12°.

Flap setting – Touchdown = 28°.

Enter chart at gross weight of 38,000 pounds (A) and read up to flap deflection of 12° (B). Read across to