PERFORMANCE & LIMITATIONS

Objective:

- To familiarize the student with limitations and performance charts, conditions that can affect performance of the aircraft, and how to calculate limitations in determining a go / no go decision.

Content:

- Determination of weight and balance condition.
- Use of performance charts, tables, and other data in determining performance in various phases of flight.
- Effects of exceeding limitations.
- Effects of atmospheric conditions on performance.
- Factors to be considered in determining that the required performance is within the airplane's single and multiengine capabilities.

Equipment:

- Markers
- Diagrams
- POH
- Notes

Instructor Actions:

- Discuss above elements and answer/ask questions

Student Actions:

- Take notes, and answer questions. Ask questions if any arise

Completion Standards:

- The lesson is complete when the elements are discussed, and questions answered. Student should be able to answer questions related to elements in this lesson. Student should be able to calculate aircraft performance from POH charts. With an understand the importance of performance & situations that adversely affect aircraft performance in making go-no go decisions.

AIRSPEEDS LIMITATIONS- IAS

Vr	Rotation Speed	71
Vx	Best Angle of Climb	71
Vy	Best Rate of Climb	85
Vxse	Best Angle 1 Engine	85
Vyse	Best Rate 1 Engine	85
Vso	Stall w/ Flaps down	60
Vs1	Stall w/ Flaps up	70
Vmc	Min Control 1 Engine	65
Va	Maneuvering (3000lbs.)	116
Va	Maneuvering (Max Gross)	132

Vno	Max Structural Cruise	154
Vne	Never Exceed	194
Vsse	1 Engine Intentional	71
Vlr	Max Gear Retraction	112
Vle/Vlo	Max Gear Speeds	140
Vfe	Flap Extension (20°)	120
Vfe	Flap Extension (Full)	110
Vg	Best Glide 3000lbs.	82
Vg	Best Glide Max Gross	95
X-wind	Max Demonstrated	25

ENGINE LIMITATIONS

- Take-off & Max Power - Full throttle , 2700 RPM
- Max Oil Temp - 245
- Max Cylinder Head Temp - 500
- Oil Temperature
  - Caution Range (Yellow Arc) - 60 – 120
  - Normal Operating Range (Green Arc) - 120-245
  - Maximum – (Red Radial) - 245
- Oil Pressure
  - Minimum Idle (Red Radial) – 25PSI
  - Caution Range (Yellow Arc) – 25-60PSI
  - Normal Operating Range (Green Arc) - 60-100PSI
  - Maximum (Red Radial Line) - 100psi

- Manifold Pressure
  - Normal Operating Range (Green Arc) – 15 to 29.6 inHG
- Tachometer
  - Normal Operating Range (Green Arc) – 2000-2700 RPM
  - Maximum (Red Radial Line) – 2700 RPM
- Fuel Pressure
  - Minimum (Red Radial) – 0.5 psi
    Normal Operating Range (Green Arc) – 0.5-8.0 psi
  - Maximum (Red Radial) – 8.0 psi
- Cylinder Head Temperature
  - Normal Operating Range (Green Arc) – 200 to 500
  - Maximum (Red Radial) – 500
- Instrument Pressure
  - Normal Operation (Green Arc) – 4.3 – 5.9 in. Hg.

FUEL LIMITATIONS

- Av Gas 100 Green, 100LL Blue
- Total Fuel 103 , 51.5 per tank
- Total Usable 100, 50 per tank
- Minimum 9 gallons per tank for engine start
- Yellow arc (Empty – 9 gallons)
- Take off in yellow arc prohibited
- Max Slip duration 30 seconds
- Fuel cross-feed system to be used in emergency conditions and level flight only

OIL LIMITATIONS

- Max 8 quarts per engine
- Min 3 quarts per engine
- Refer to Servicing Section POH Section VIII for approved Engine Oils

MANEUVERS

- Normal Category
- Aerobatic maneuvers including spins are prohibited
- Max Slip Duration 30 seconds
- Positive maneuver Loads
  - Flaps up 3.8G
  - Flaps down 2.0 G
- Negative Maneuver Load
  - Flaps up -1.52g

LOAD LIMITATIONS @ 3900

Positive Maneuvering Load Factors

- Flaps up – 3.8 G
- Flaps down – 2.0G

Negative Maneuvering Load Factor

- -1.52G

KINDS OF OPERATION

- VFR Day / Night
- IFR Day / Night
- Part 91 operations when all limitations and performance considerations are complied with
- Flight into Known Icing Conditions is prohibited

WEIGHT & BALANCE

- A weight and balance must be performed prior to every flight during preflight preparation.
- It must be determined prior to every flight that the aircraft is with in it's weight and C.G limitations.
- Flight outside of these limitations significantly affect performance and controllability of the aircraft.

EFFECTS OF WEIGHT

- The pilot should always be aware of the consequences of overloading.
- An overloaded aircraft may not be able to leave the ground, or if it does become airborne, it may exhibit unexpected and unusually poor flight characteristics.
- If not properly loaded, the initial indication of poor performance usually takes place during takeoff.

Excessive weight reduces the flight performance in almost every respect. For example, the most important performance deficiencies of an overloaded aircraft are:

- Higher takeoff speed
- Longer takeoff run
- Reduced rate and angle of climb
- Lower maximum altitude
- Shorter range
- Reduced cruising speed
- Reduced maneuverability
- Higher stalling speed
- Higher approach and landing speed
- Longer landing roll
- Excessive weight on the nose wheel or tail wheel

SAMPLE WEIGHT AND BALANCE

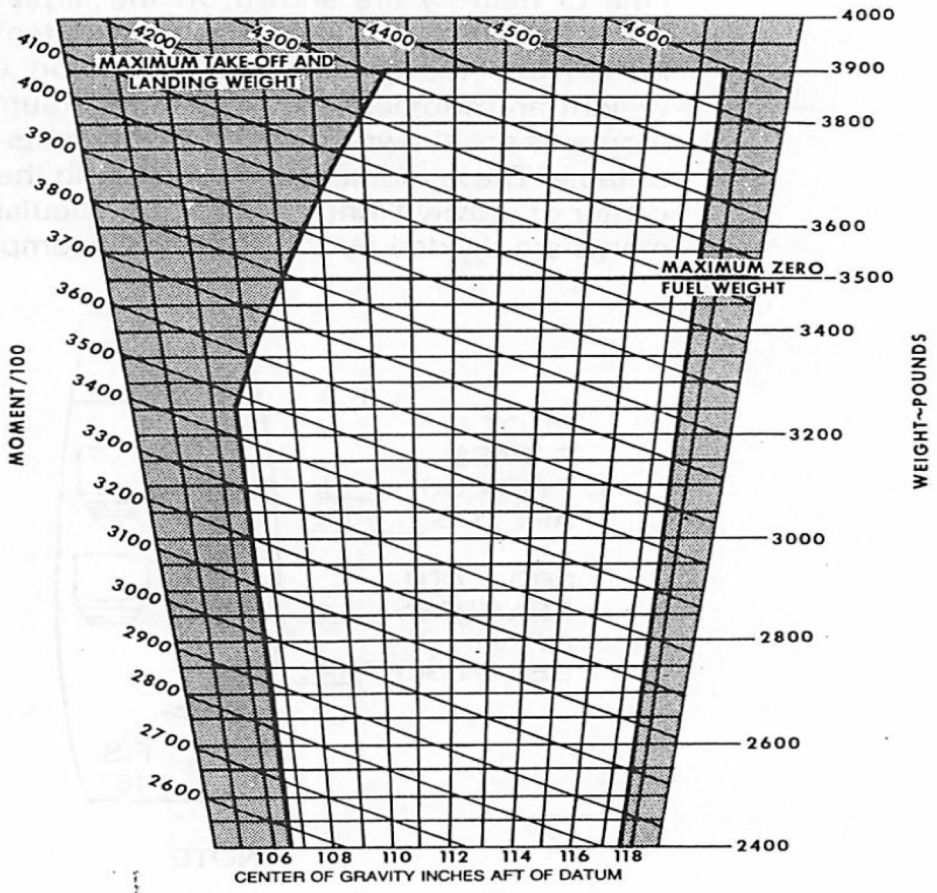
WEIGHT AND BALANCE LOADING FORM

MODEL *DUCHESS 76* DATE *0/0/00*
SERIAL NO. *ME-00* REG. NO. *NXXXXX*

ITEM	WEIGHT	MOM/100
1. BASIC EMPTY CONDITION	2543	2775
2. FRONT SEAT OCCUPANTS	340	380
3. 3rd & 4th SEAT OCCUPANTS OR BENCH SEAT OCCUPANTS	340	490
4.	—	—
5. AFT BAGGAGE	93	155
6. **SUB TOTAL** ZERO FUEL CONDITION (3500 LBS MAX.)	3316	3800
7. FUEL LOADING (100 gal.)	600	702
8. **SUB TOTAL** RAMP CONDITION	3916	4502
9. *LESS FUEL FOR START, TAXI, AND TAKEOFF	—16	—19
10. **SUB TOTAL** TAKE-OFF CONDITION	3900	4483
11. LESS FUEL TO DESTINATION (80 gal.)	—480	—562
12. **LANDING CONDITION**	3420	3921

*Fuel for start, taxi, and takeoff is normally 16 lbs at an average mom/100 of 19.

MOMENT LIMITS VS WEIGHT



ENVELOPE BASED ON THE FOLLOWING WEIGHT AND CENTER OF GRAVITY LIMIT DATA (LANDING GEAR DOWN)

WEIGHT CONDITION	FWD C. G. LIMIT	AFT C. G. LIMIT
3900 POUNDS (MAX. TAKE-OFF/LANDING)	110.6	117.5
3250 POUNDS OR LESS	106.6	117.5

76-601-6

MOMENT LIMITS vs WEIGHT

WEIGHT POUNDS	MOMENT/100 FWD LIMIT	MOMENT/100 AFT LIMIT	WEIGHT POUNDS	MOMENT/100 FWD LIMIT	MOMENT/100 AFT LIMIT
2300	2452	2703	3125	3331	3672
2325	2479	2732	3150	3358	3701
2350	2505	2761	3175	3385	3731
2375	2532	2791	3200	3411	3760
2400	2558	2820			
2425	2585	2849	3225	3438	3789
2450	2612	2879	3250	3465	3819
2475	2638	2908	3275	3496	3848
2500	2665	2938	3300	3528	3878
2525	2692	2967	3325	3560	3907
2550	2718	2996	3350	3592	3936
2575	2745	3026	3375	3624	3966
2600	2772	3055	3400	3656	3995
2625	2798	3084	3425	3688	4024
2650	2825	3114	3450	3720	4054
2675	2852	3143	3475	3753	4083
2700	2878	3173	3500	3785	4113
2725	2905	3202	3525	3817	4142
2750	2932	3231	3550	3850	4171
2775	2958	3261	3575	3882	4201
2800	2985	3290	3600	3915	4230
2825	3012	3319	3625	3948	4259
2850	3038	3349	3650	3981	4289
2875	3065	3378	3675	4014	4318
2900	3091	3408	3700	4047	4348
2925	3118	3437	3725	4080	4377
2950	3145	3466	3750	4113	4406
2975	3171	3496	3775	4146	4436
3000	3198	3525	3800	4179	4465
3025	3225	3554	3825	4213	4494
3050	3251	3584	3850	4246	4524
3075	3278	3613	3875	4280	4553
3100	3305	3643	3900	4313	4583

OCCUPANTS

WEIGHT	FRONT SEATS			3RD AND 4TH SEATS	
	*FWD POS.		*AFT POS.	STD. BENCH	OPTIONAL
	††ARM **104	†ARM **105	ARM **112	ARM **142	ARM **144
	MOMENT/100				
120	125	126	134	170	173
130	135	137	146	185	187
140	146	147	157	199	202
150	156	158	168	213	216
160	166	168	179	227	230
170	177	179	190	241	245
180	187	189	202	256	259
190	198	200	213	270	274
200	208	210	224	284	288
210	218	220	235	298	302
220	228	231	246	312	317
230	239	241	258	327	331
240	250	252	269	341	346
250	260	262	280	355	360

† Effective ME-1 thru ME-20
†† Effective ME-21 and after
* Reclining seat with back in full-up position
** Values computed from a C.G. criterion based on a 170 pound male. Differences in physical characteristics can cause variation in center of gravity location.

USEFUL LOAD WEIGHTS AND MOMENTS

BAGGAGE
ARM 167

WEIGHT	MOMENT / 100
10	17
20	33
30	50
40	67
50	84
60	100
70	117
80	134
90	150
100	167
110	184
120	200
130	217
140	234
150	251
160	267
170	284
180	301
190	317
200	334

USEFUL LOAD WEIGHTS AND MOMENTS
USABLE FUEL
ARM 117.0

GALLONS	WEIGHT LBS	MOMENT 100
10	60	70
20	120	140
30	180	211
40	240	281
50	300	351
60	360	421
70	420	491
80	480	562
90	540	632
100	600	702

MAXIMUM CERTIFICATED WEIGHTS

- Maximum Ramp Weight 3916 lbs.
- Maximum Takeoff Weight 3900 lbs.
- Maximum Landing Weight 3900 lbs.
- Maximum Zero Fuel Weight 3500 lbs.
- Max Weight in Baggage Compartment 200 lbs.
- Maximum Useful Load 1470 lbs.
- **Zero Fuel Weight |** Zero fuel weight is the maximum weight of passengers and baggage less the fuel weight that the airplane can withstand before structural damage occurs. Zero fuel weight for the Duchess is 3,500 lbs.

C.G LIMITATIONS

- Forward C.G of 106.6 Inches at 3250 lbs.
- Aft C.G. 110.6 Inches at 3900 lbs.

EFFECTS OF AFT / FORWARDS C.G

AFT

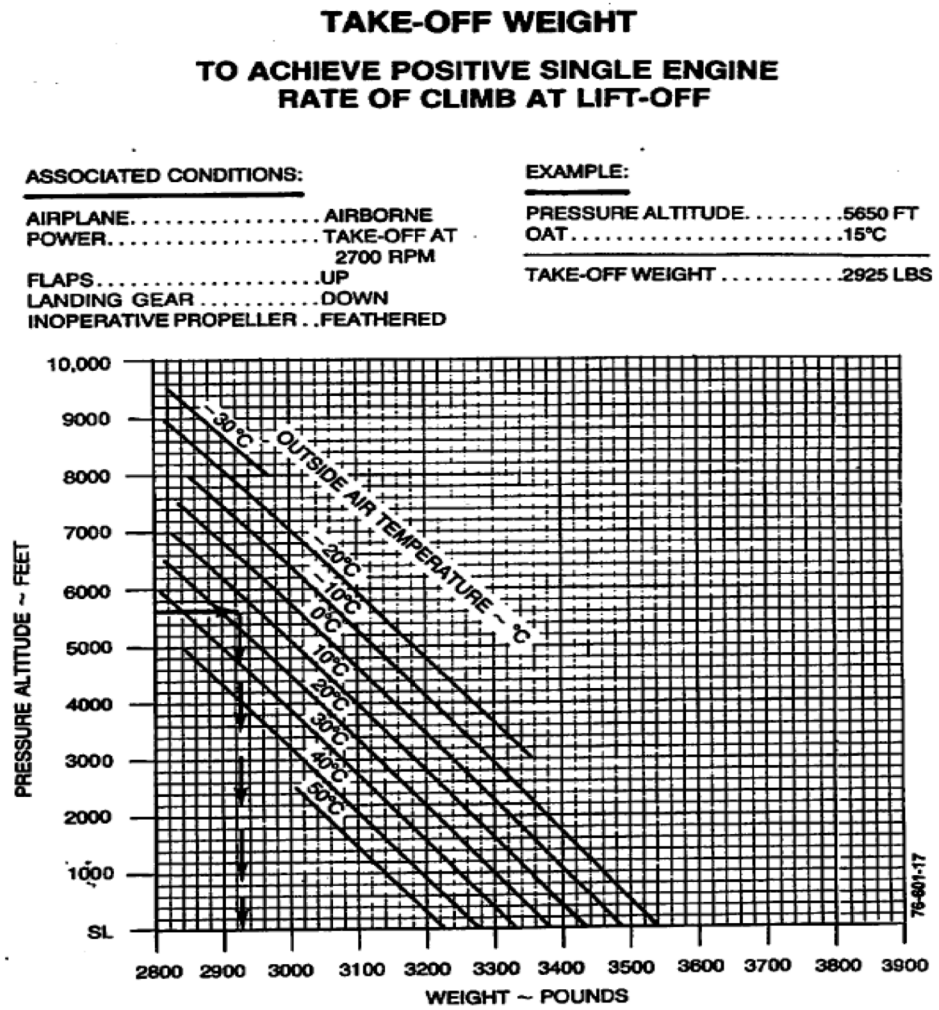
- Poor Nose Steering, less weight on nose
- Easier to rotate
- Better climb performance
- Better Cruise performance
- Decrease stall speed
- Difficult to recover from a stall
- Difficult to maintain Vyse

Forward

PERFORMANCE CHARTS

- Takeoff Weight for Positive Single Engine Rate of Climb
- Crosswind
- Takeoff Distance / Soft Field Takeoff Distance
- Accelerate Stop & Accelerate God Distances
- Two Engine Climb
- Takeoff Climb Gradient Single Engine

TAKEOFF WEIGHT FOR POSITIVE SINGLE ENGINE RATE OF CLIMB AT LIFTOFF

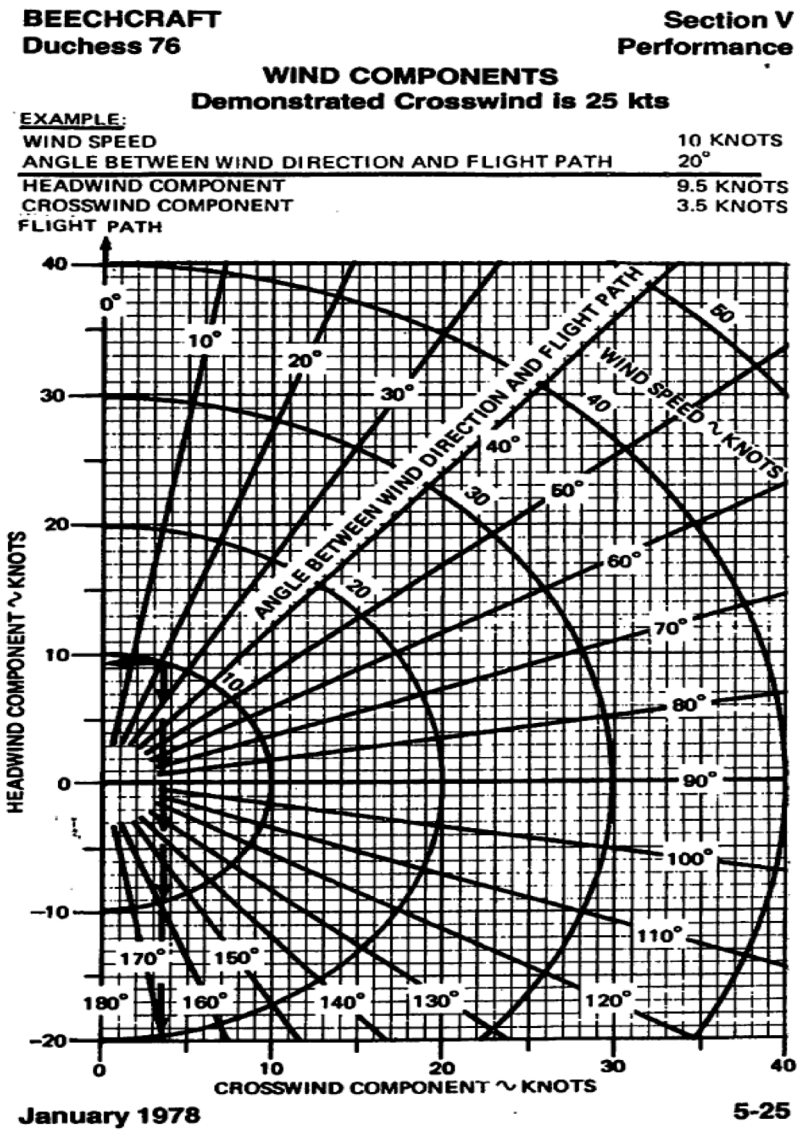


- Charts is used to simply determine if at your weight and atmospheric conditions you can climb.
- See Single Engine Rate of Climb Chart.
- In preflight planning we must always be planning for a potential engine failure on takeoff.
- Never takeoff at a weight or density altitude that will not guarantee a positive rate of climb on a single engine
- Note performance charts are for new airplanes performed under ideal performance. Always plan for less!
- Exceeding limitations ensures negative performance

SINGLE ENGINE CLIMB RATE

- This chart is for exactly what the title implies. Plug in your weight from the weight & balance to determine if you will be able to climb at liftoff, period. If you can't, then you are committed to pulling throttles to idle and stopping the airplane.
- Accelerate-Go would be impossible in this case.
- These charts were printed in 1980 when the airplanes were new. Always assume that your airplane will not live up to the performance stated in the charts.
- Always plan for worst case scenario and always give yourself an out. Always fly under the assumption "what if".

CROSSWIND LIMITATIONS



- Demonstrated Crosswind is 25 knots.
- Exceeding Crosswind limitation places the aircraft in a position where it is likely you will run out of control input to land straight.
- Cross wind landing with a Sideload on the gear places the aircraft in a position for a possible gear collapse, or runoff the side of the runway.
- Consider changing runways or airports.

TAKE-OFF DISTANCE

TAKE-OFF DISTANCE

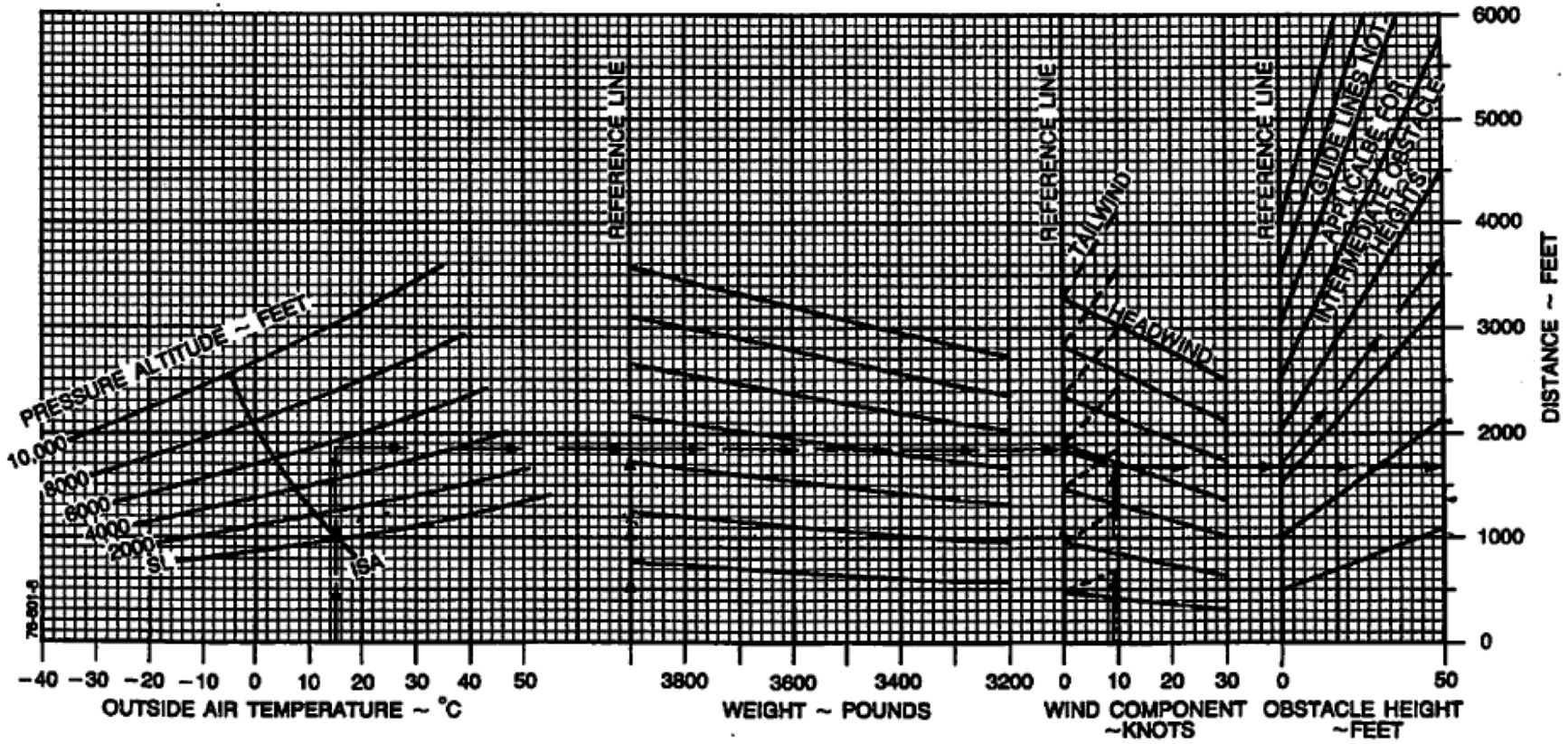
ASSOCIATED CONDITIONS:

POWER	TAKE-OFF POWER AT 2700 RPM SET BEFORE BRAKE RELEASE
MIXTURE	FULL RICH (ABOVE 5000 FT LEAN TO 75°-100°F ON RICH SIDE OF PEAK EGT)
FLAPS	UP
LANDING GEAR	RETRACT AFTER POSITIVE CLIMB ESTABLISHED
RUNWAY	PAVED, LEVEL, DRY SURFACE
COWL FLAPS	OPEN

TAKE-OFF SPEEDS (ALL WEIGHTS)	
LIFT-OFF	71 KNOTS
50 FEET	80 KNOTS

EXAMPLE:

OAT	15°C
PRESSURE ALTITUDE	5650 FT
TAKE-OFF WEIGHT	3900 LBS
HEADWIND COMPONENT	9.5 KTS
GROUND ROLL	1680 FT
TOTAL DISTANCE OVER 50-FT OBSTACLE	3670 FT



TAKE-OFF DISTANCE

- Note Conditions.
- Exceeding limitations on weight and atmospheric conditions is poor judgment. Your not a test pilot. Unknown, poor performance.
- Consider personal minimums when using a takeoff distance chart.
- Ground roll distance provides the pilot with a rough estimate of location of Vr speed. Refer to a runway/ taxi diagram and locate a rotation spot on the runway.
- If Vr is not reached be predetermined spot consider the reality of a potential engine abnormality, possible abort takeoff.
- Ground roll should never be more than ½ of the runway length. See Accelerate Stop Distance Chart.
- Takeoff Distance provides distance to where the aircraft is only 50ft off the ground. Consider terrain, gives yourself significant margin for clearance.
- Personal Minimum of ½ runway length for takeoff distance allows for a landing after engine failure at 50 ft.

TAKE OFF DISTANCE SOFT FIELD

TAKE-OFF DISTANCE - GRASS SURFACE

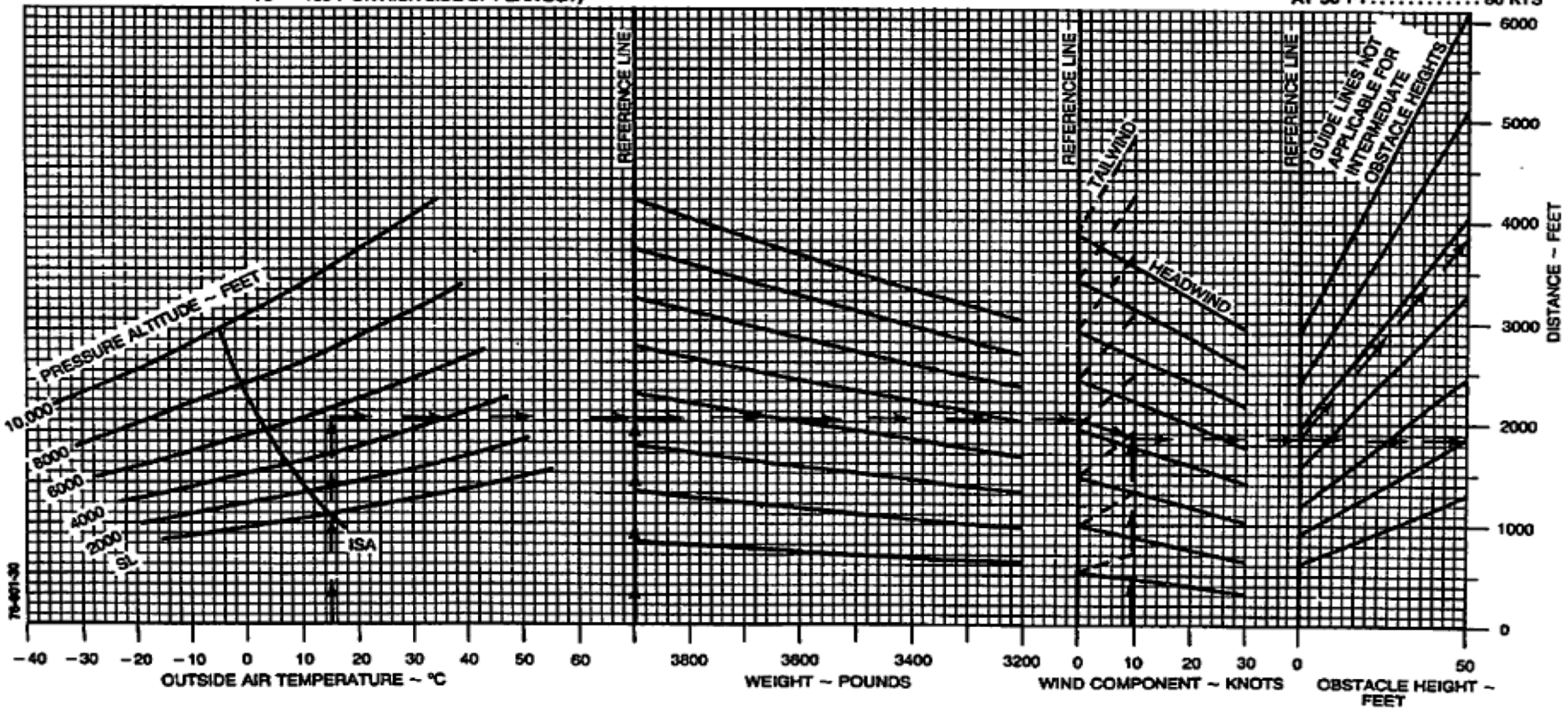
ASSOCIATED CONDITIONS:

POWER ..... TAKE-OFF AT 2700 RPM SET BEFORE BRAKE RELEASE
FLAPS ..... UP
LANDING GEAR ..... RETRACT AFTER POSITIVE CLIMB ESTABLISHED
RUNWAY ..... SHORT, DRY GRASS, LEVEL SURFACE
COWL FLAPS ..... OPEN
MIXTURE ..... FULL RICH (ABOVE 5000 FT LEAN TO 75° – 100°F ON RICH SIDE OF PEAK EGT)

TAKE-OFF SPEEDS (ALL WEIGHTS)	
LIFT-OFF	71 KNOTS
50 FEET	80 KNOTS

EXAMPLE:

OAT	15°C
PRESSURE ALTITUDE	5650 FT
TAKE-OFF WEIGHT	3900 LBS
HEADWIND COMPONENT	9.5 KTS
GROUND ROLL	1850 FT
TOTAL DISTANCE OVER 50 FT OBSTACLE	3850 FT
TAKE-OFF SPEED: AT LIFT-OFF	71 KTS
AT 50 FT	80 KTS



SOFT FIELD TAKE-OFF DISTANCE

- Note Conditions
- Consider personal minimums when using a takeoff distance chart.
- Exceeding limitations on weight and atmospheric conditions is poor judgment. Your not a test pilot. Unknown, poor performance.
- Ground roll distance provides the pilot with a rough estimate of location of Vr speed. Refer to a runway/ taxi diagram and locate a rotation spot on the runway.
- If Vr is not reached be predetermined spot consider the reality of a potential engine abnormality, possible abort takeoff.
- Ground roll should never be more than ½ of the runway length. See Accelerate Stop Distance Chart.
- Takeoff Distance provides distance to where the aircraft is only 50ft off the ground. Consider terrain, gives yourself significant margin for clearance.
- Personal Minimum of ½ runway length for takeoff distance allows for a landing after engine failure at 50 ft.

ACCELERATE STOP DISTANCE

ACCELERATE - STOP DISTANCE

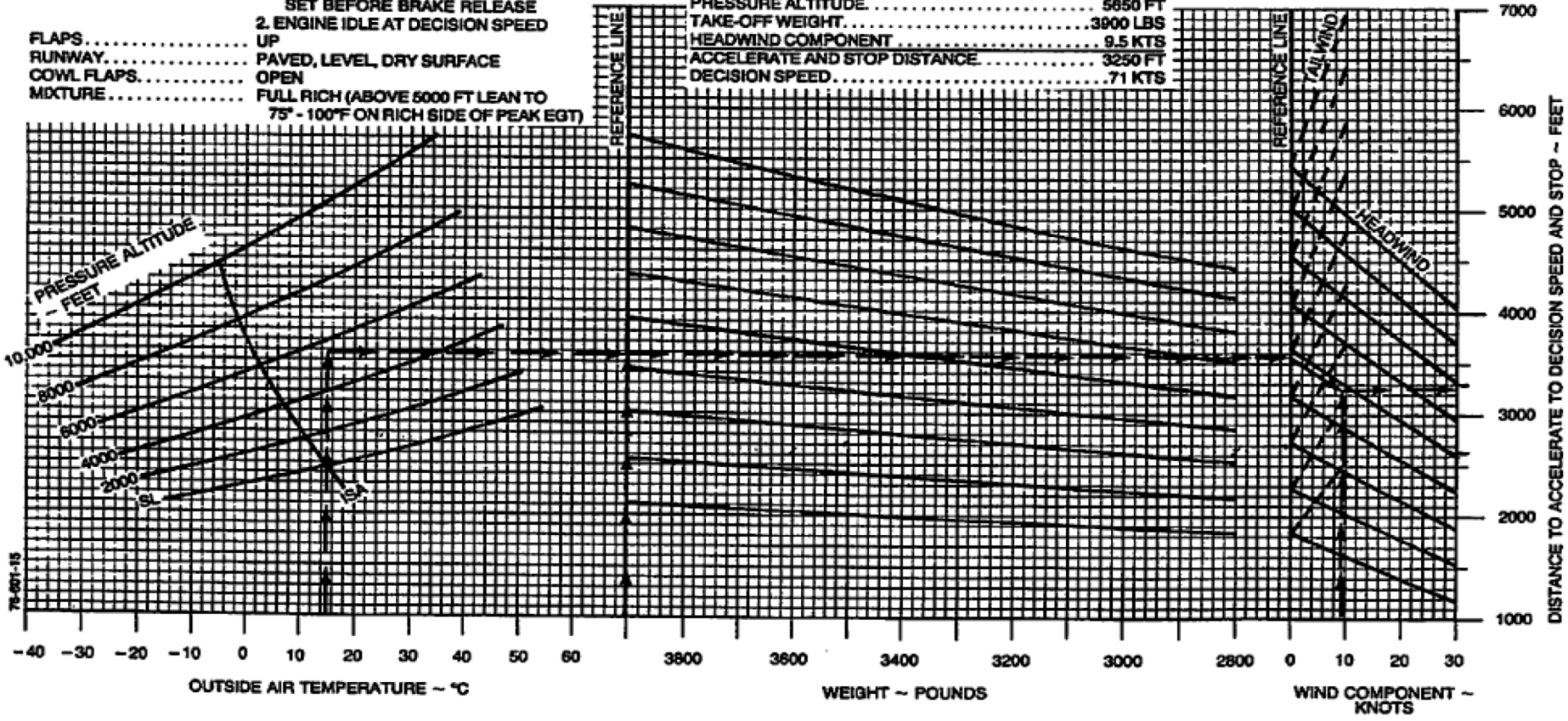
DECISION SPEED 71 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

POWER	1. TAKE-OFF POWER AT 2700 RPM SET BEFORE BRAKE RELEASE 2. ENGINE IDLE AT DECISION SPEED
FLAPS	UP
RUNWAY	PAVED, LEVEL, DRY SURFACE
COWL FLAPS	OPEN
MIXTURE	FULL RICH (ABOVE 5000 FT LEAN TO 75° - 100°F ON RICH SIDE OF PEAK EGT)

EXAMPLE:

OAT	15°C
PRESSURE ALTITUDE	5650 FT
TAKE-OFF WEIGHT	3900 LBS
HEADWIND COMPONENT	9.5 KTS
ACCELERATE AND STOP DISTANCE	3250 FT
DECISION SPEED	71 KTS



ACCELERATE STOP DISTANCE

- Accelerate-Stop distance is the distance required to accelerate to liftoff speed Vr (71) and, assuming failure of an engine at the instant liftoff speed is attained, bringing throttles to idle and stopping the airplane.
- Exceeding limitations on weight and atmospheric conditions us poor judgment. Your not a test pilot. Unknown, poor performance.
- The FARs do not specifically require that the runway length be equal to or greater than the accelerate-stop distance.
- Most AFM/POH publish accelerate-stop distances only as an advisory.
- It becomes a limitation only when published in the limitations section of the AFM/POH.
- Using runway lengths of at least the accelerate-stop distance is a good operating and safety practice.
- If Distance is to long reduce weight, wait, change runways.
- Never land on a runway that you are not sure you can takeoff from!

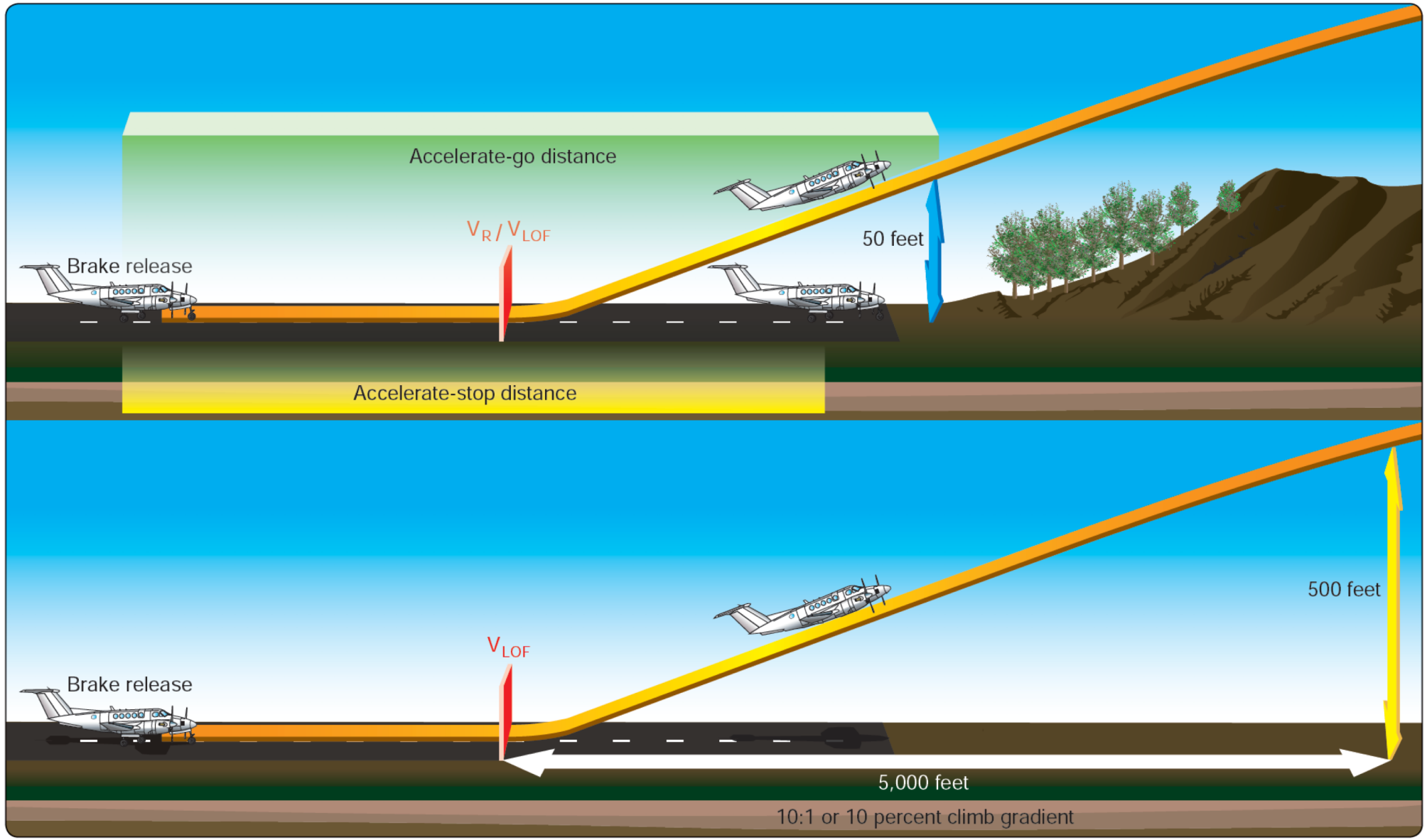


Figure 12-5. *Accelerate-stop distance, accelerate-go distance, and climb gradient.*

ACCELERATE GO DISTANCE

ACCELERATE-GO DISTANCE

ASSOCIATED CONDITIONS:

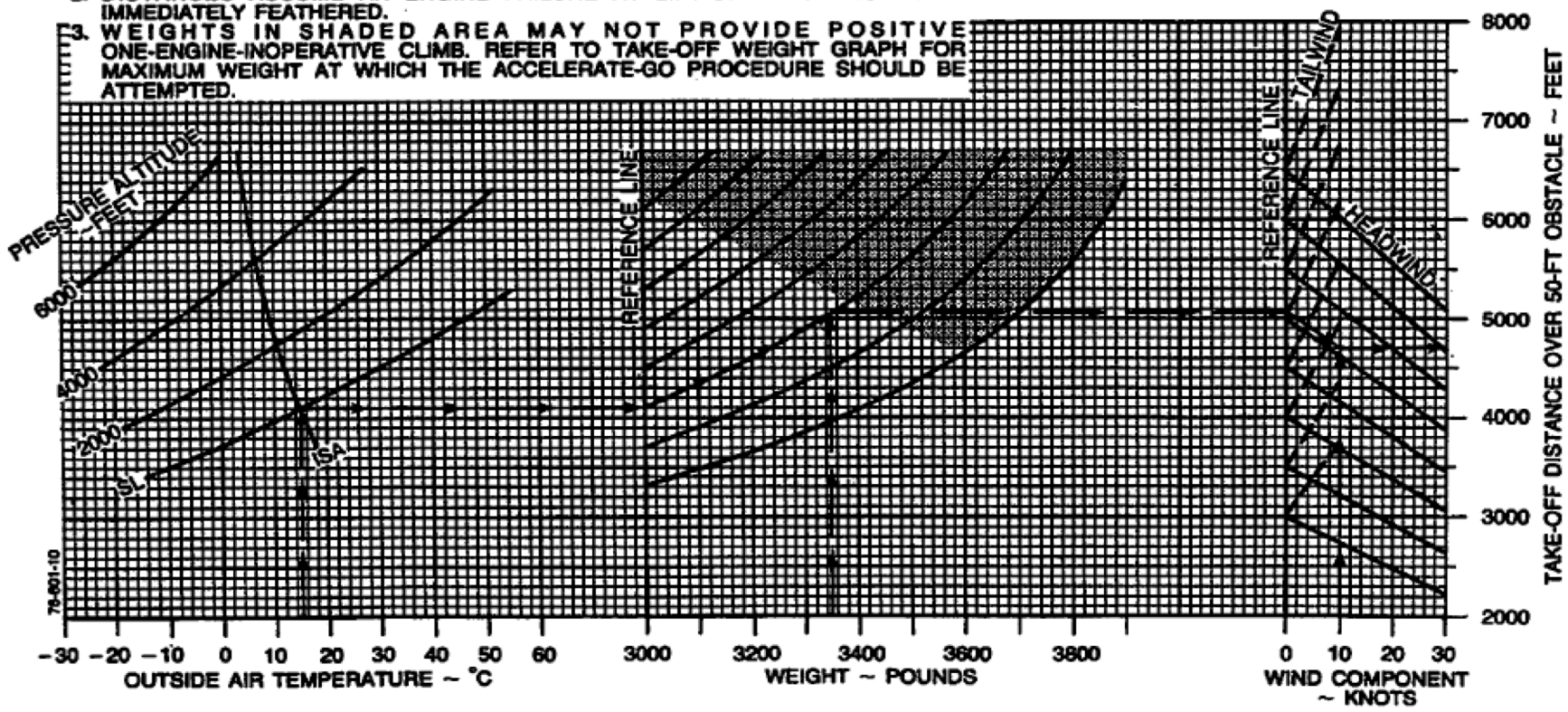
POWER	TAKE-OFF POWER AT 2700 RPM. SET BEFORE BRAKE RELEASE.
FLAPS	UP
LANDING GEAR	RETRACT AFTER LIFT-OFF.
RUNWAY	PAVED, LEVEL, DRY SURFACE.
COWL FLAPS	OPEN
MIXTURE	FULL RICH (ABOVE 5000 FT, SET TO 75-100°F ON RICH SIDE OF PEAK EGT)

TAKE-OFF SPEEDS (ALL WEIGHTS)	
LIFT-OFF	71 KNOTS
50 FT	80 KNOTS

EXAMPLE:

OAT	15°C
PRESSURE ALTITUDE	SL
TAKE-OFF WEIGHT	3350 LBS
HEADWIND COMPONENT	10 KTS
TOTAL DISTANCE OVER 50-FT OBSTACLE	4700 FT
GROUND ROLL	940 FT

NOTE:
1. GROUND ROLL DISTANCE IS 20% OF TAKE-OFF DISTANCE OVER 50-FT OBSTACLE.
2. DISTANCES ASSUME AN ENGINE FAILURE AT LIFT-OFF AND PROPELLER IMMEDIATELY FEATHERED.
3. WEIGHTS IN SHADED AREA MAY NOT PROVIDE POSITIVE ONE-ENGINE-INOPERATIVE CLIMB. REFER TO TAKE-OFF WEIGHT GRAPH FOR MAXIMUM WEIGHT AT WHICH THE ACCELERATE-GO PROCEDURE SHOULD BE ATTEMPTED.



ACCELERATE GO DISTANCE

- Accelerate-Go distance is the distance required to accelerate to liftoff speed Vr (71) and, assuming failure of an engine at the instant liftoff speed is attained, continuing the takeoff and climbing to 50'.
- Performance Chart assumes at the moment of engine failure the inop engine is feathered.
- Exceeding limitations on weight and atmospheric conditions is poor judgment. Your not a test pilot. Unknown, poor performance.
- Accelerate God distance assumes perfect performance by pilot and aircraft and that has only brought the plane 50 feet of the ground! Leave significant margin.
- If an engine fails below VMC while airborne, directional control is not possible with the remaining engine producing takeoff power. On takeoffs, therefore, the airplane should never be airborne before the airspeed reaches and exceeds VMC.
- Know before you try to takeoff whether you can maintain control and climb out if you lose an engine with the gear still down!
- *See Single Engine Rate of Climb. If single engine rate of climb is less than 0 , DON''T TAKEOFF! In the event of an engine failure you have not choice but to land!

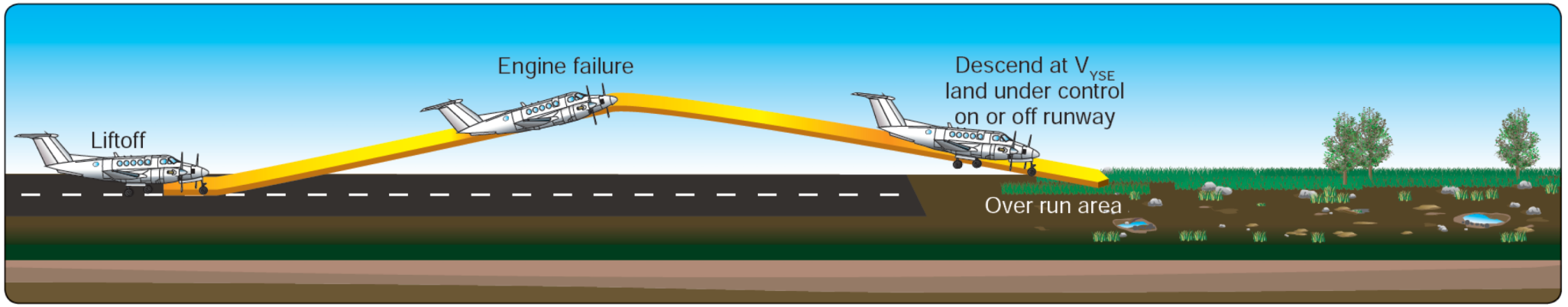


Figure 12-12. *Engine failure on takeoff, inadequate climb performance.*

- The accelerate-go distance, under ideal circumstances = 50 feet above the takeoff elevation.
- To achieve even this meager climb, the pilot had to instantaneously recognize and react to an unanticipated engine failure, retract the landing gear, identify and feather the correct engine, all the while maintaining precise airspeed control and bank angle as the airspeed is nursed to VYSE. Assuming flawless airmanship thus far, the airplane has now arrived at a point little more than one wingspan above the terrain, assuming it was absolutely level and without obstructions.

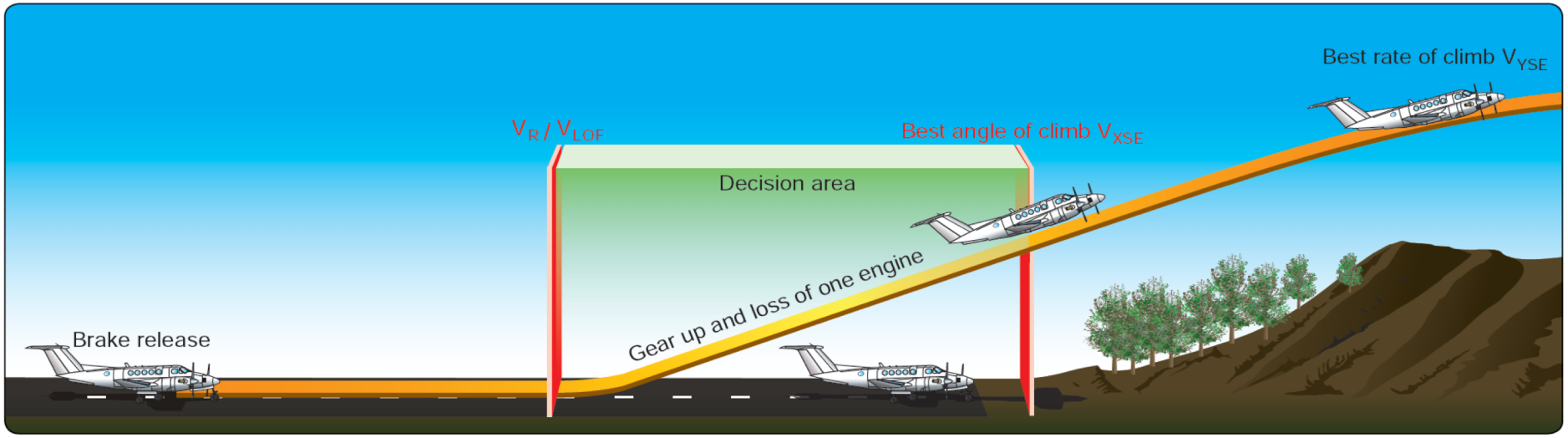


Figure 12-6. *Area of decision for engine failure after lift-off.*

TWO ENGINE CLIMB

CLIMB - TWO ENGINE

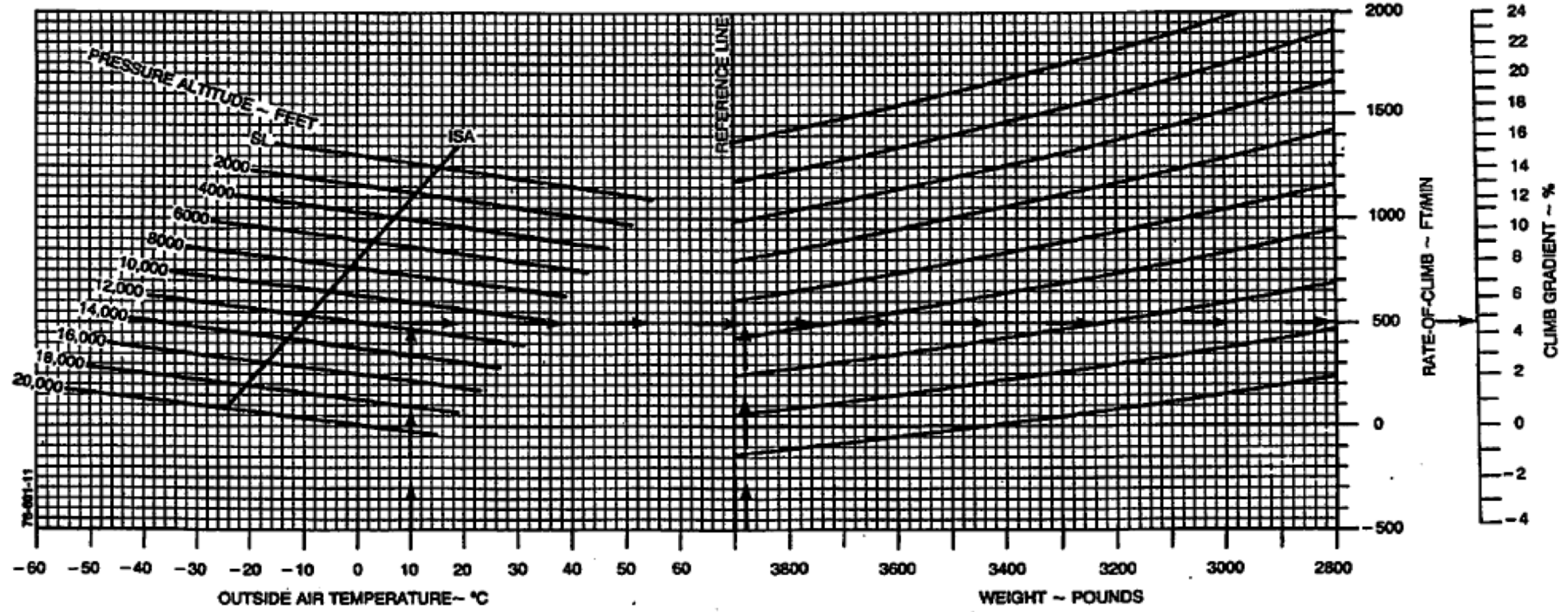
CLIMB SPEED 85 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

POWER	MAXIMUM CONTINUOUS AT 2700 RPM
FLAPS	UP
LANDING GEAR	UP
COWL FLAPS	OPEN
MIXTURE	FULL RICH (ABOVE 5000 FT LEAN TO 75° - 100°F ON RICH SIDE OF PEAK EGT)

EXAMPLE:

OAT	10°C
PRESSURE ALTITUDE	11,500 FT
WEIGHT	3880 LBS
RATE OF CLIMB	500 FT/MIN
CLIMB GRADIENT	4.6%



TWO ENGINE CLIMB

- Note Conditions
- Climb Speed is 85 Vyse
- Two engine climb chart is used to determine the expected two engine climb rate at various atmospheric conditions and various weights.
- This chart is specifically used to determine safe climb for terrain avoidance and MCA clearance.
- Mountainous 2000’ , Non- Mountainous 1000’
- Exceeding limitations on weight and atmospheric conditions is poor judgment. Your not a test pilot. Unknown, poor performance.
- Note expected performance along flight to determine how the engines are performing. Charts at determined for optimal performance.

TAKEOFF CLIMB GRADIENT SINGLE ENGINE

TAKE-OFF CLIMB GRADIENT – ONE ENGINE INOPERATIVE

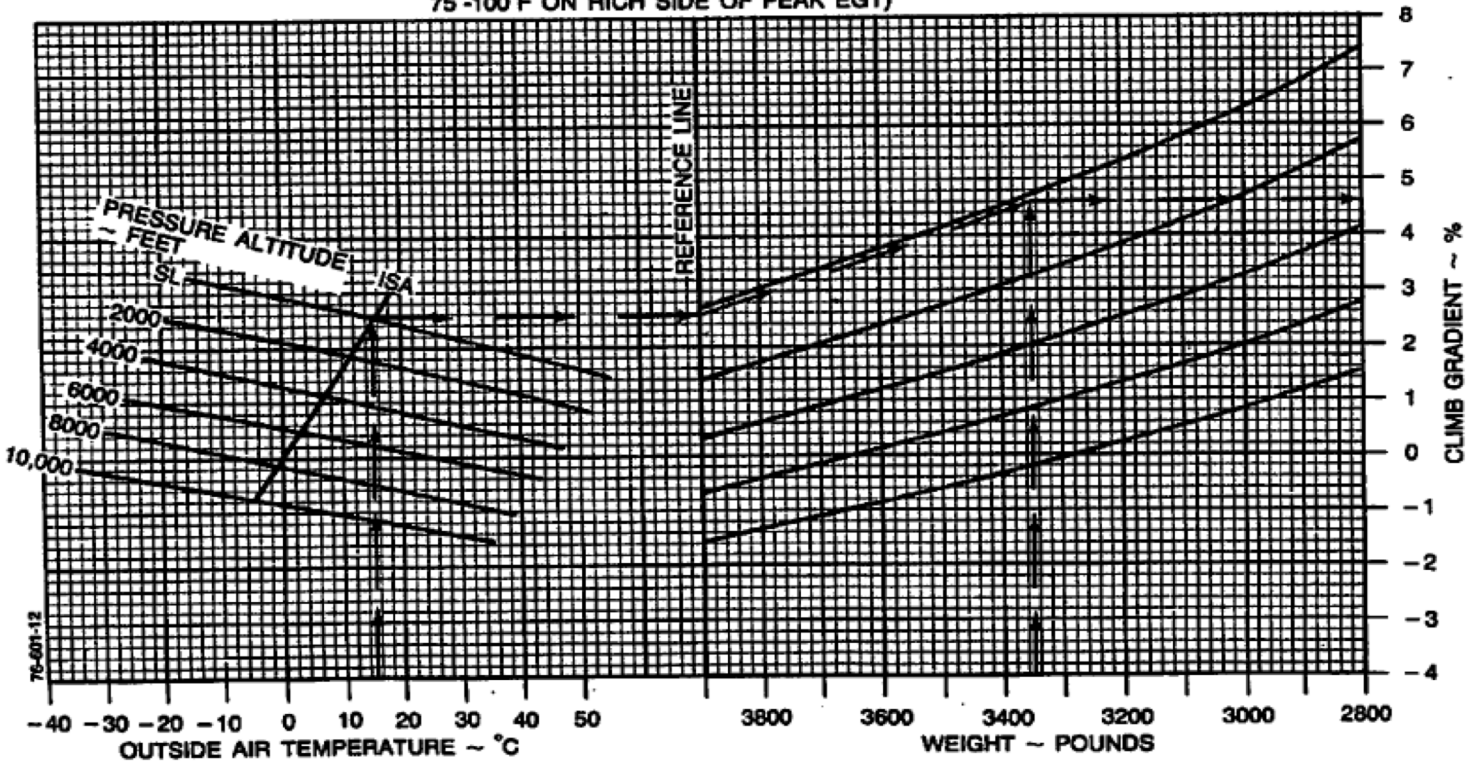
CLIMB SPEED 80 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

POWER	TAKE-OFF AT 2700 RPM
LANDING GEAR	UP
FLAPS	UP
INOPERATIVE PROPELLER	FEATHERED
COWL FLAPS	OPEN
MIXTURE	FULL RICH (ABOVE 5000 FT LEAN TO 75°-100°F ON RICH SIDE OF PEAK EGT)

EXAMPLE:

OAT	15°C
PRESSURE ALTITUDE	SL
WEIGHT	3350 LBS
GRADIENT OF CLIMB	4.6%



TAKEOFF CLIMB GRADIENT SINGLE ENGINE

- Takeoff Climb gradient chart helps the pilot in preflight planning to determine under various atmospheric conditions and weights if the aircraft not only can liftoff but maintain a positive climb gradient in the event of an engine failure.
- Note note all aircraft (under 6000 or Vso less than 1.27Vso2) are required to have a positive single engine climb performance. But only must be specified.
- Do not exceed the limitations of the chart. If you do, then you are committed to pulling throttles to idle and stopping the airplane on engine failure
- Accelerate-Go would be impossible in this case.
- These charts were printed in 1980 when the airplanes were new. Always assume that your airplane will not live up to the performance stated in the charts.
- Always plan for worst case scenario and always give yourself an out. Always fly under the assumption "what if".

TIME, FUEL, DISTANCE TO CLIMB

TIME, FUEL, AND DISTANCE TO CLIMB

CLIMB SPEED 100 KNOTS

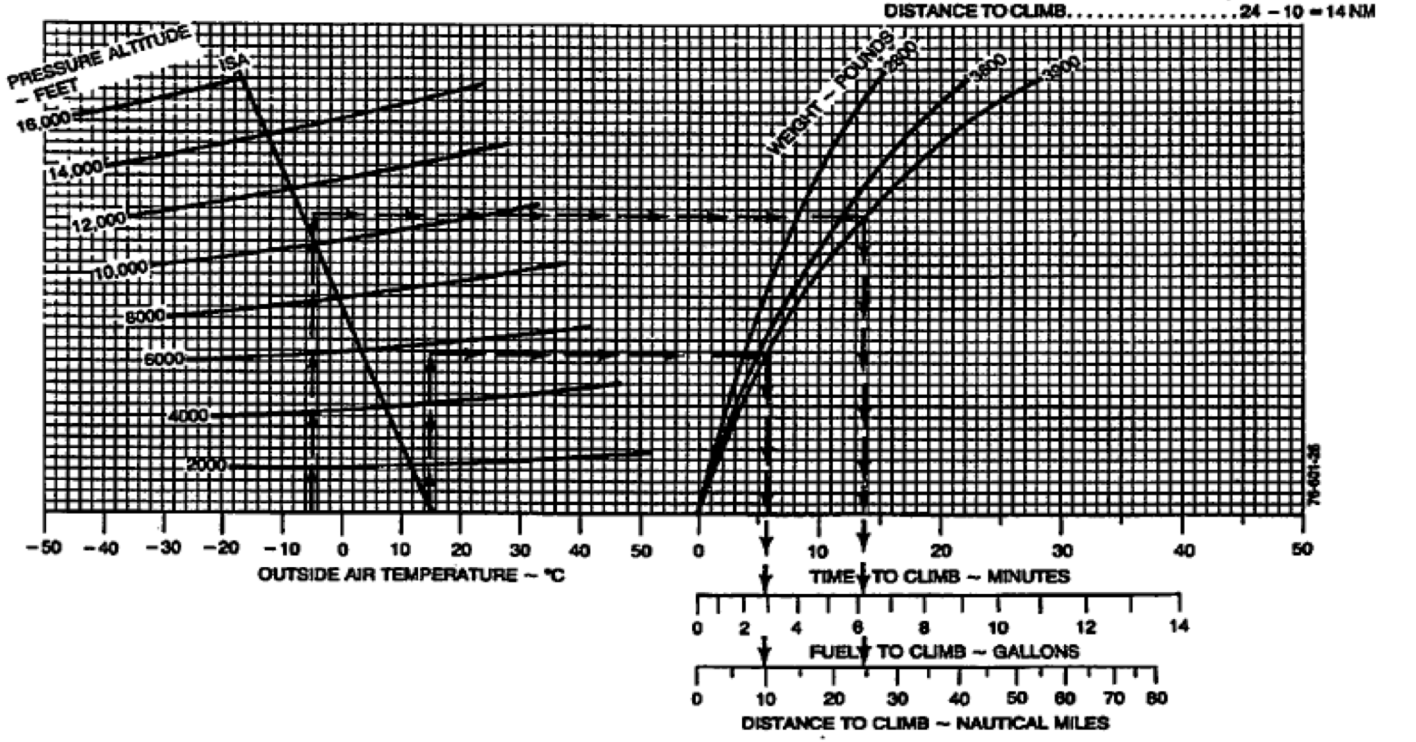
ASSOCIATED CONDITIONS:

POWER..... FULL THROTTLE AT 2600 RPM
FUEL DENSITY..... 6.0 LBS/GAL
COWL FLAPS..... OPEN
MIXTURE..... FULL RICH (ABOVE 5000 FT LEAN TO 75° - 100°F ON RICH SIDE OF PEAK EGT)

EXAMPLE:

OAT AT TAKE-OFF.....15°C
OAT AT CRUISE.....-5°C
AIRPORT PRESSURE ALTITUDE.....5650 FT
CRUISE PRESSURE ALTITUDE.....11,500 FT
INITIAL CLIMB WEIGHT.....3900 LBS

TIME TO CLIMB.....14 – 6 = 8 MINUTES
FUEL TO CLIMB.....6.1 – 2.8 = 3.3 GAL
DISTANCE TO CLIMB.....24 – 10 = 14 NM



TIME, FUEL, DISTANCE TO CLIMB

- Note Conditions
- Assumes en0route climb speed = 100 knots
- Time, Fuel, Distance Chart to climb is used to determine the time, distance, and fuel required to takeoff and reach top of climb, or time from one altitude to climb to another altitude. Under various weights and atmospheric conditions.

CLIMB ONE ENGINE INOPERATIVE

CLIMB - ONE ENGINE INOPERATIVE

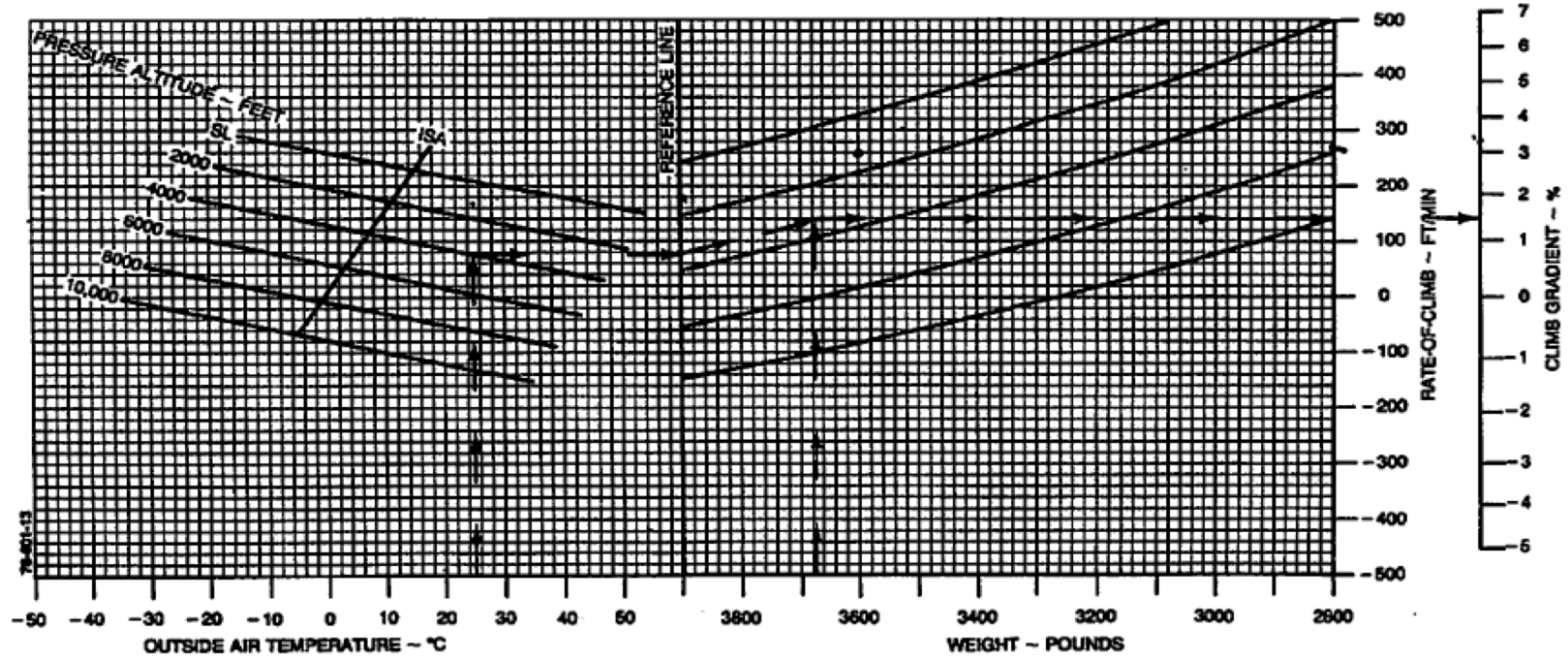
CLIMB SPEED 85 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

POWER	TAKE-OFF AT 2700 RPM
LANDING GEAR	UP
FLAPS	UP
INOPERATIVE PROPELLER	FEATHERED
COWL FLAPS	OPEN
MIXTURE	FULL RICH (ABOVE 5000 FT LEAN TO 75° - 100°F ON RICH SIDE OF PEAK EGT)

EXAMPLE:

OAT	25°C
PRESSURE ALTITUDE	3965 FT
WEIGHT	3677 LBS
RATE OF CLIMB	140 FT/MIN
CLIMB GRADIENT	1.5%
CLIMB SPEED	85 KTS



CLIMB ONE ENGINE INOPERATIVE

- Note Conditions
- Climd Speed Vyse = 85knots
- Climb one engine inoperative chart gives you expected climb performance positive or negative for various atmospheric conditions an weights.
- In preflight planning use this chart to determine if the aircraft can climb on single engine to clear terrain and maintain IFR clearance limits.
- If the aircraft has an engine failure above it's single engine service celing it will drift down to that ceiling for atmospheric conditions and weight.
- No before you can go if you can still maintain positive rate of climb on a single engine for the whole of the flight. If not plan a different route, reduce weight, wait for better conditions.
- Note that the limitations of weights, altitudes, and temperatures. Attempting to climb outside of the charted limits exceeds the limitation of the aircraft.

SINGLE ENGINE SERVICE CEILING

SERVICE CEILING - ONE ENGINE INOPERATIVE

CLIMB SPEED - 85 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

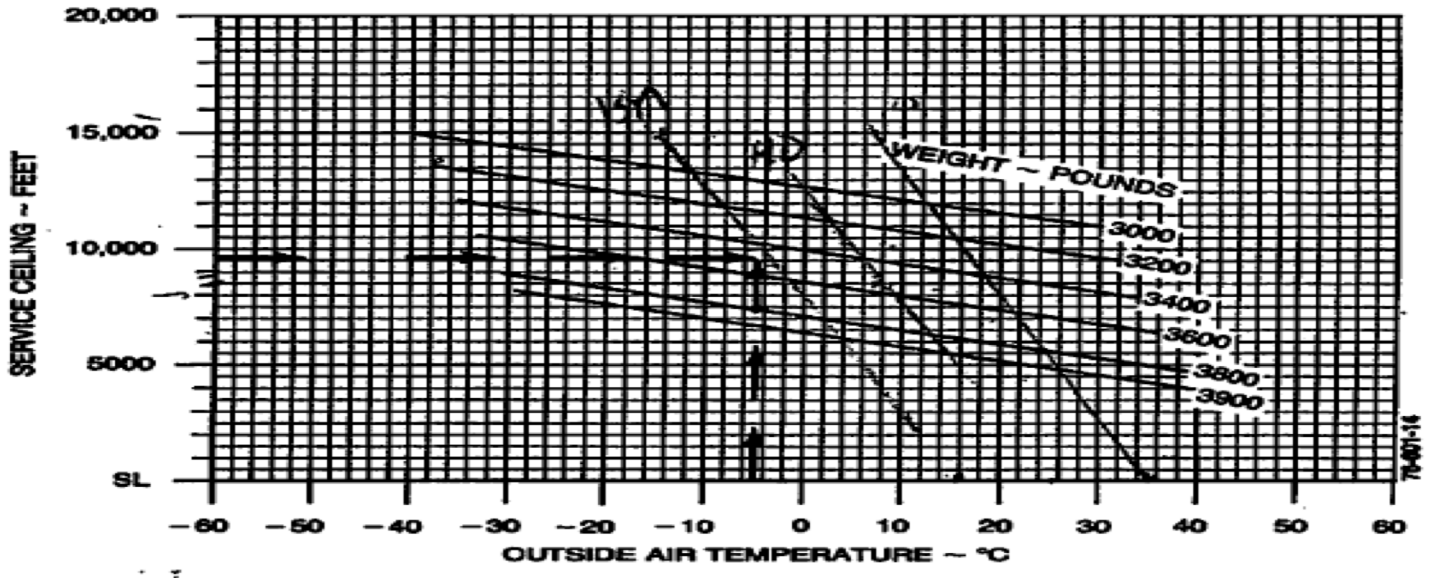
POWER . . . . . MAXIMUM CONTINUOUS AT 2700 RPM
FLAPS . . . . . UP
LANDING GEAR . . . . . UP
INOPERATIVE PROPELLER . . . FEATHERED

EXAMPLE:

OAT AT MEA . . . . . −5°C
ROUTE SEGMENT MEA . . . . . 9700 FT

WEIGHT FOR SERVICE CEILING AT ROUTE SEGMENT MEA . . . . . 3480 LBS

NOTE: SERVICE CEILING IS ALTITUDE WHERE AIRPLANE HAS CAPABILITY OF CLIMBING 50 FT/MIN WITH ONE PROPELLER FEATHERED.



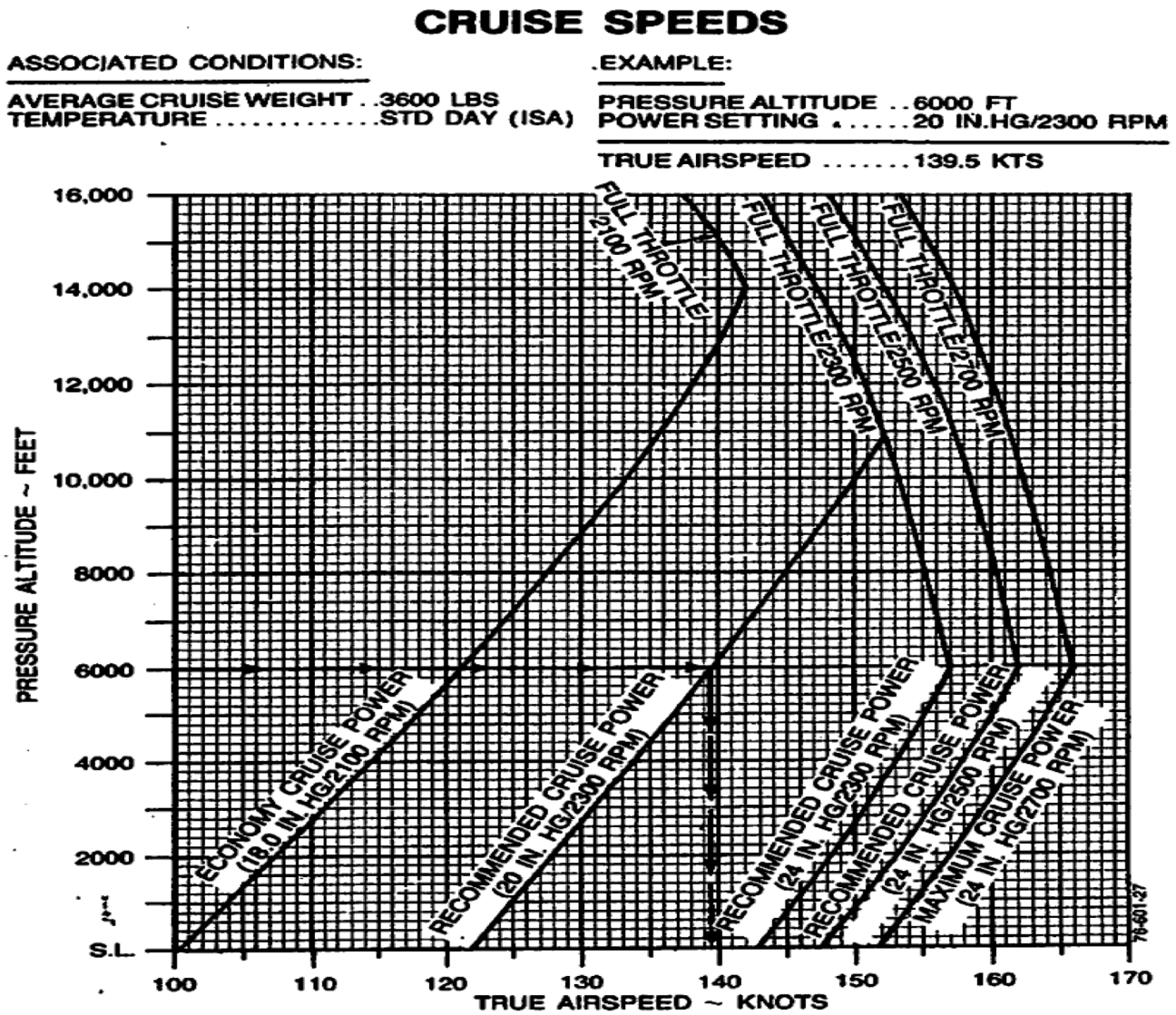
SINGLE ENGINE SERVICE CEILING

- Note Conditions
- Assumes Vyse = 85 knots
- The highest altitude at which the airplane can maintain a steady rate of climb of 50 fpm with one engine operating at full power and one engine's propeller feathered.
- During the enroute preflight planning segments consider obstacle clearance, MEA's, MCA's, OROCA's, MSA's in relation to the expected Single Engine Service Ceiling.
- If your Single Engine Service Ceiling will not allow you to meet required altitudes change your routing, reduce weight, wait for better conitions!

SINGLE ENGINE ABSOLUTE CEILING

- The altitude where climb is no longer possible with one engine operating at full power and one engine's propeller feathered.
- If the airplane is flying above the single-engine service ceiling and one engine fails in flight, the airplane will drift down from its current altitude to the single-engine service ceiling.
  - Above the single-engine absolute ceiling, VYSE yields the minimum rate of sink.
  - For example if an airplane's single-engine absolute ceiling is 5,000 ft. and while cruising at 9,000 ft. an engine fails, the airplane will drift down (descend) to 5,000 ft.
  - Planning must be made to ensure terrain clearance, MEA's, MCA's, ect. in the case of an engine failure en-route during pre-flight planning

CRUISE SPEED



MAX CRUISE POWER

MAXIMUM CRUISE POWER - 24.0 IN. HG @ 2700 RPM (OR FULL THROTTLE)

PRESS ALT	ISA −20°C (−36°F)							STANDARD DAY (ISA)							ISA +20°C (+36°F)						
	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS
FEET	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS
SL	-3	27	24.0	67	11.1	156	151	17	63	24.0	65	10.8	152	152	37	99	24.0	62	10.3	148	153
1000	-5	23	24.0	68	11.3	156	153	15	59	24.0	65	10.8	152	155	35	95	24.0	63	10.5	148	156
2000	-7	19	24.0	68	11.3	156	155	13	55	24.0	66	11.0	152	157	33	91	24.0	63	10.5	148	158
3000	-9	16	24.0	69	11.5	156	158	11	52	24.0	66	11.0	152	159	31	88	24.0	64	10.7	148	161
4000	-11	12	24.0	69	11.5	157	160	9	48	24.0	67	11.2	153	162	30	86	24.0	65	10.8	149	163
5000	-12	10	24.0	70	11.7	157	163	8	46	24.0	68	11.3	153	164	28	82	24.0	65	10.8	148	165
6000	-14	7	23.5	70	11.7	156	164	6	43	23.5	68	11.3	152	166	26	79	23.5	65	10.8	148	167
7000	-16	3	22.6	68	11.3	153	164	4	39	22.6	65	10.8	149	165	24	75	22.6	63	10.5	145	166
8000	-18	0	21.8	65	10.8	150	163	2	36	21.8	63	10.5	146	164	22	72	21.8	61	10.2	142	165
9000	-20	-4	20.9	63	10.5	147	162	0	32	20.9	61	10.2	143	163	20	68	20.9	59	9.8	139	164
10,000	-22	-8	20.2	61	10.2	144	161	-2	28	20.2	59	9.8	140	162	18	64	20.2	57	9.5	135	163
11,000	-24	-11	19.4	59	9.8	141	160	-4	25	19.4	57	9.5	136	161	16	61	19.4	55	9.2	132	162
12,000	-26	-15	18.6	56	9.3	138	159	-6	21	18.6	54	9.0	133	160	14	57	18.6	53	8.8	129	161
13,000	-28	-18	17.9	54	9.0	134	157	-8	18	17.9	52	8.7	130	158	12	54	17.9	50	8.3	126	159
14,000	-31	-24	17.2	52	8.7	131	156	-10	14	17.2	50	8.3	127	157	10	50	17.2	48	8.0	122	157
15,000	-33	-27	16.6	50	8.3	127	154	-12	10	16.6	48	8.0	123	155	8	46	16.6	47	7.8	119	155
16,000	-35	-31	15.9	48	8.0	124	152	-15	5	15.9	46	7.7	120	153	6	43	15.9	45	7.5	115	153

NOTES:
1. Full throttle manifold pressure settings are approximate.
2. Shaded area represents operation with full throttle.
3. Lean to 25° - 50°F on rich side of peak EGT.
4. Cruise speeds are presented at an average weight of 3600 lbs.

RECOMMENDED CRUISE POWER

RECOMMENDED CRUISE POWER - 24.0 IN. HG @ 2500 RPM (OR FULL THROTTLE)

PRESS ALT	ISA −20°C (−36°F)							STANDARD DAY (ISA)							ISA +20°C (+36°F)						
	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS
FEET	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS
SL	-3	27	24.0	61	10.2	152	147	17	63	24.0	59	9.8	148	148	37	99	24.0	57	9.5	144	149
1000	-5	23	24.0	62	10.3	152	149	15	59	24.0	60	10.0	148	151	35	95	24.0	58	9.7	144	151
2000	-7	19	24.0	63	10.5	153	152	13	55	24.0	61	10.2	148	153	33	91	24.0	58	9.7	144	154
3000	-9	16	24.0	64	10.7	153	154	11	52	24.0	61	10.2	149	155	31	88	24.0	59	9.8	144	156
4000	-11	12	24.0	64	10.7	153	156	9	48	24.0	62	10.3	149	158	29	84	24.0	60	10.0	144	159
5000	-13	9	24.0	65	10.8	153	159	7	45	24.0	63	10.5	149	160	28	82	24.0	61	10.2	144	161
6000	-15	5	23.6	66	11.0	153	161	6	43	23.6	63	10.5	148	162	26	79	23.6	61	10.2	144	163
7000	-17	1	22.7	63	10.5	150	160	4	39	22.7	61	10.2	145	161	24	75	22.7	59	9.8	141	162
8000	-19	-2	21.9	61	10.2	146	159	2	36	21.9	59	9.8	142	160	22	72	21.9	57	9.5	138	161
9000	-21	-6	21.0	59	9.8	143	158	0	32	21.0	57	9.5	139	159	20	68	21.0	55	9.2	135	160
10,000	-23	-9	20.2	57	9.5	140	157	-3	27	20.2	55	9.2	136	158	18	64	20.2	53	8.8	132	159
11,000	-25	-13	19.4	55	9.2	137	156	-5	23	19.4	53	8.8	133	157	16	61	19.4	51	8.5	129	158
12,000	-27	-17	18.7	53	8.8	134	155	-7	19	18.7	51	8.5	130	156	14	57	18.7	49	8.2	125	156
13,000	-29	-20	18.0	51	8.5	131	153	-9	16	18.0	49	8.2	126	154	11	52	18.0	47	7.8	122	155
14,000	-31	-24	17.3	49	8.2	127	152	-11	12	17.3	47	7.8	123	152	9	48	17.3	45	7.5	118	153
15,000	-33	-27	16.6	47	7.8	124	150	-13	9	16.6	45	7.5	120	151	7	45	16.6	44	7.3	115	151
16,000	-35	-31	16.0	45	7.5	121	148	-15	5	16.0	43	7.2	116	148	5	41	16.0	42	7.0	111	148

NOTES:
1. Full throttle manifold pressure settings are approximate.
2. Shaded area represents operation with full throttle.
3. Lean to 25° - 50°F on rich side of peak EGT.
4. Cruise speeds are presented at an average weight of 3600 lbs.

RECOMMENDED CRUISE POWER - 24.0 IN. HG @ 2300 RPM (OR FULL THROTTLE)

PRESS ALT	ISA −20°C (−36°F)							STANDARD DAY (ISA)							ISA +20°C (+36°F)						
	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS
FEET	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS
SL	-3	27	24.0	55	9.2	147	142	17	63	24.0	53	8.8	143	143	37	99	24.0	51	8.5	139	144
1000	-5	23	24.0	56	9.3	147	144	15	59	24.0	54	9.0	143	145	35	95	24.0	52	8.7	139	146
2000	-7	19	24.0	57	9.5	148	147	13	55	24.0	55	9.2	143	148	33	91	24.0	53	8.8	139	149
3000	-9	16	24.0	58	9.7	148	149	11	52	24.0	56	9.3	144	150	31	88	24.0	54	9.0	139	151
4000	-11	12	24.0	59	9.8	148	152	9	48	24.0	57	9.5	144	153	29	84	24.0	55	9.2	140	153
5000	-13	9	24.0	60	10.0	148	154	7	45	24.0	58	9.7	144	155	27	81	24.0	56	9.3	140	156
6000	-15	5	23.7	61	10.2	148	156	5	41	23.7	59	9.8	144	157	25	77	23.7	57	9.5	140	158
7000	-17	1	22.8	59	9.8	145	155	3	37	22.8	57	9.5	141	156	23	73	22.8	55	9.2	137	157
8000	-19	-2	21.9	57	9.5	142	154	1	34	21.9	55	9.2	138	155	21	70	21.9	53	8.8	134	156
9000	-21	-6	21.1	55	9.2	139	153	-1	30	21.1	53	8.8	135	154	19	66	21.1	51	8.5	131	155
10,000	-23	-9	20.3	53	8.8	136	152	-3	27	20.3	51	8.5	132	153	17	63	20.3	49	8.2	127	154
11,000	-25	-13	19.5	51	8.5	133	151	-5	23	19.5	49	8.2	129	152	15	59	19.5	47	7.8	124	152
12,000	-27	-17	18.8	49	8.2	130	150	-7	19	18.8	47	7.8	125	151	13	55	18.8	46	7.7	121	151
13,000	-29	-20	18.0	47	7.8	127	148	-9	16	18.0	46	7.7	122	149	11	52	18.0	44	7.3	117	149
14,000	-31	-24	17.3	45	7.5	123	147	-11	12	17.3	44	7.3	119	147	9	48	17.3	42	7.0	114	147
15,000	-33	-27	16.7	44	7.3	120	145	-13	9	16.7	42	7.0	115	145	7	45	16.7	41	6.8	110	144
16,000	-35	-31	16.0	42	7.0	116	143	-15	5	16.0	40	6.7	111	143	5	41	16.0	39	6.5	106	142

NOTES:
1. Full throttle manifold pressure settings are approximate.
2. Shaded area represents operation with full throttle.
3. Lean to 25° - 50°F on rich side of peak EGT.
4. Cruise speeds are presented at an average weight of 3600 lbs.

RECOMMENDED CRUISE POWER - 20.0 IN. HG @ 2300 RPM (OR FULL THROTTLE)

PRESS ALT.	ISA −20°C (−36°F)							STANDARD DAY (ISA)							ISA +20°C (+36°F)						
	IOAT		MAN. PRESS.	FUEL FLOW/ ENGINE		IAS	TAS	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS	IOAT		MAN. PRESS	FUEL FLOW/ ENGINE		IAS	TAS
FEET	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS
SL	-4	25	20.0	41	6.8	127	122	16	61	20.0	40	6.7	123	123	36	97	20.0	38	6.3	119	123
1000	-6	21	20.0	42	7.0	128	125	14	57	20.0	41	6.8	124	126	34	93	20.0	39	6.5	120	126
2000	-7	19	20.0	43	7.2	129	128	13	55	20.0	42	7.0	125	129	33	91	20.0	40	6.7	121	129
3000	-9	16	20.0	44	7.3	130	131	11	52	20.0	42	7.0	126	132	31	88	20.0	41	6.8	122	132
4000	-11	12	20.0	45	7.5	131	134	9	48	20.0	43	7.2	127	135	29	84	20.0	42	7.0	122	135
5000	-13	9	20.0	46	7.7	131	136	7	45	20.0	44	7.3	127	137	27	81	20.0	43	7.2	123	137
6000	-15	5	20.0	47	7.8	132	139	5	41	20.0	45	7.5	128	140	25	77	20.0	44	7.3	124	140
7000	-17	1	20.0	48	8.0	133	142	3	37	20.0	46	7.7	128	143	23	73	20.0	45	7.5	124	143
8000	-19	-2	20.0	49	8.2	133	145	1	34	20.0	47	7.8	129	145	21	70	20.0	46	7.7	125	146
9000	-21	-6	20.0	50	8.3	134	147	-1	30	20.0	48	8.0	129	148	19	66	20.0	47	7.8	125	149
10,000	-23	-9	20.0	51	8.5	134	150	-3	27	20.0	49	8.2	130	151	17	63	20.0	48	8.0	125	151
11,000	-25	-13	19.5	51	8.5	133	151	-5	23	19.5	49	8.2	129	152	15	59	19.5	47	7.8	124	152
12,000	-27	-17	18.8	49	8.2	130	150	-7	19	18.8	47	7.8	125	151	13	55	18.8	46	7.7	121	151
13,000	-29	-20	18.0	47	7.8	127	148	-9	16	18.0	46	7.7	122	149	11	52	18.0	44	7.3	117	149
14,000	-31	-24	17.3	45	7.5	123	147	-11	12	17.3	44	7.3	119	147	9	48	17.3	42	7.0	114	147
15,000	-33	-27	16.7	44	7.3	120	145	-13	9	16.7	42	7.0	115	145	7	45	16.7	41	6.8	110	144
16,000	-35	-31	16.0	42	7.0	116	143	-15	5	16.0	40	6.7	111	143	5	41	16.0	39	6.5	106	142

NOTES:
1. Full throttle manifold pressure settings are approximate.
2. Shaded area represents operation with full throttle.
3. Lean to 25° - 50°F on rich side of peak EGT.
4. Cruise speeds are presented at an average weight of 3600 lbs.

ECONOMY CRUISE POWER - 18.0 IN. HG @ 2100 RPM (OR FULL THROTTLE)

PRESS ALT	ISA −20°C (−36°F)							STANDARD DAY (ISA)							ISA +20°C (+36°F)						
	IOAT		MAN. PRESS.	FUEL FLOW/ ENG		IAS	TAS	IOAT		MAN. PRESS.	FUEL FLOW/ ENG		IAS	TAS	IOAT		MAN. PRESS.	FUEL FLOW/ ENG		IAS	TAS
FEET	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS	°C	°F	IN.HG	PPH	GPH	KTS	KTS
SL	-4	25	18.0	29	4.8	104	101	16	61	18.0	28	4.7	99	100	36	97	18.0	27	4.5	96	98
1000	-6	21	18.0	30	5.0	106	105	14	57	18.0	29	4.8	101	104	34	93	18.0	28	4.7	95	102
2000	-8	18	18.0	31	5.2	107	108	12	54	18.0	30	5.0	103	107	32	90	18.0	29	4.8	98	106
3000	-10	14	18.0	32	5.3	109	112	10	50	18.0	31	5.2	105	111	30	86	18.0	30	5.0	101	110
4000	-12	11	18.0	34	5.7	111	115	8	47	18.0	32	5.3	107	115	28	83	18.0	31	5.2	103	113
5000	-14	8	18.0	35	5.8	112	119	6	43	18.0	33	5.5	108	118	26	79	18.0	32	5.3	103	117
6000	-16	4	18.0	36	6.0	113	121	5	40	18.0	35	5.8	109	121	25	76	18.0	33	5.5	105	120
7000	-17	1	18.0	37	6.2	115	125	3	37	18.0	36	6.0	110	124	23	73	18.0	34	5.7	106	124
8000	-19	-3	18.0	38	6.3	116	128	1	33	18.0	37	6.2	111	127	21	69	18.0	35	5.8	106	127
9000	-21	-6	18.0	39	6.5	117	131	-1	30	18.0	38	6.3	112	130	19	66	18.0	36	6.0	108	130
10,000	-23	-10	18.0	40	6.7	117	134	-3	26	18.0	39	6.5	113	134	17	62	18.0	37	6.2	108	133
11,000	-25	-13	18.0	41	6.8	117	136	-5	23	18.0	39	6.5	113	136	15	59	18.0	38	6.3	108	135
12,000	-27	-17	18.0	41	6.8	117	138	-7	19	18.0	40	6.7	113	138	13	55	18.0	38	6.3	108	137
13,000	-29	-20	18.0	42	7.0	117	140	-9	16	18.0	41	6.8	113	140	11	52	18.0	39	6.6	108	139
14,000	-31	-24	17.3	43	7.2	117	142	-11	12	17.3	41	6.8	112	142	9	48	17.3	40	6.7	108	141
15,000	-33	-27	16.5	41	6.8	114	140	-13	9	16.5	40	6.7	109	140	7	45	16.5	38	6.3	105	138
16,000	-35	-31	15.8	39	6.5	110	138	-15	5	15.8	38	6.3	106	137	5	41	15.8	37	6.2	101	135

NOTES: 1. Full throttle manifold pressure settings are approximate.
2. Shaded area represents operation with full throttle.
3. Lean to 25° - 50°F on rich side of peak EGT.
4. Cruise speeds are presented at an average weight of 3600 lbs.

RANGE PROFILE

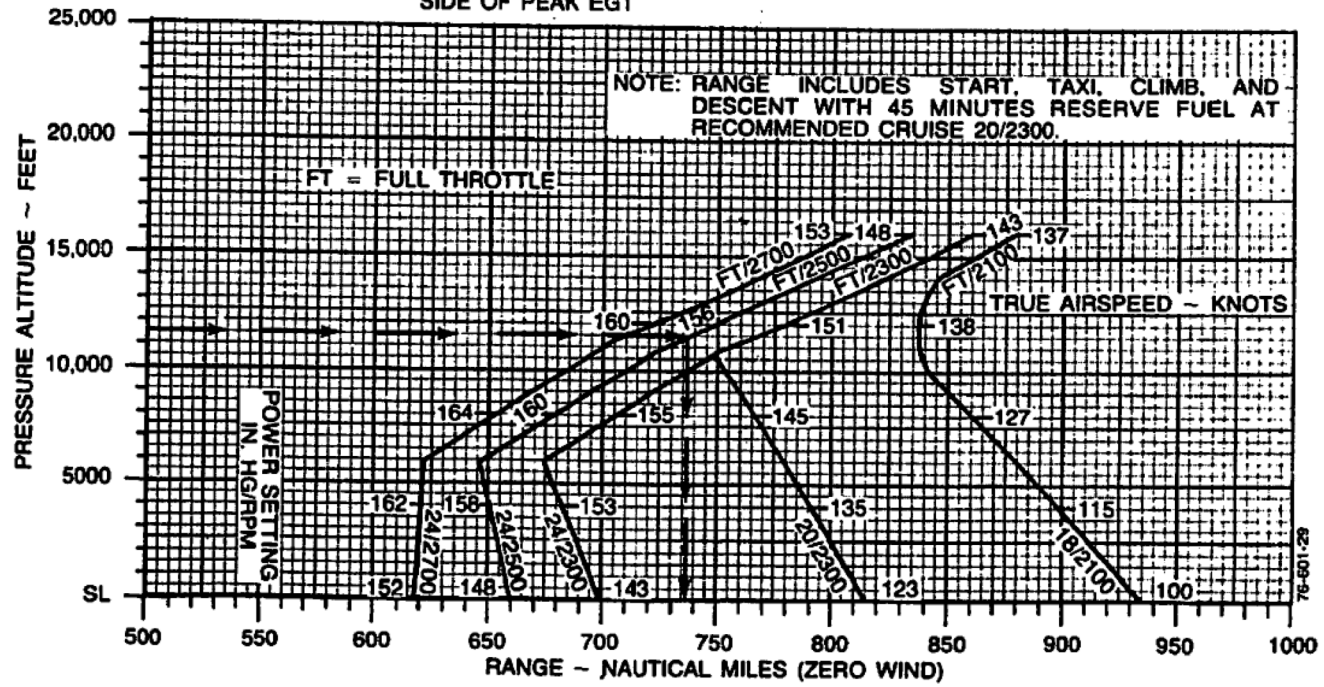
RANGE PROFILE – 100 GALLONS
STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

WEIGHT	3916 LBS BEFORE ENGINE START
FUEL	AVIATION GASOLINE
FUEL DENSITY	6.0 LBS/GAL
INITIAL FUEL LOADING	100 US GAL (600 LBS)
COWL FLAPS	CLOSED
MIXTURE	LEANED TO 25°-50°F ON RICH SIDE OF PEAK EGT

EXAMPLE:

PRESSURE ALTITUDE	11,500 FT
POWER SETTING	FT/2500 RPM
RANGE	737 NM



ENDURACNE PROFILE

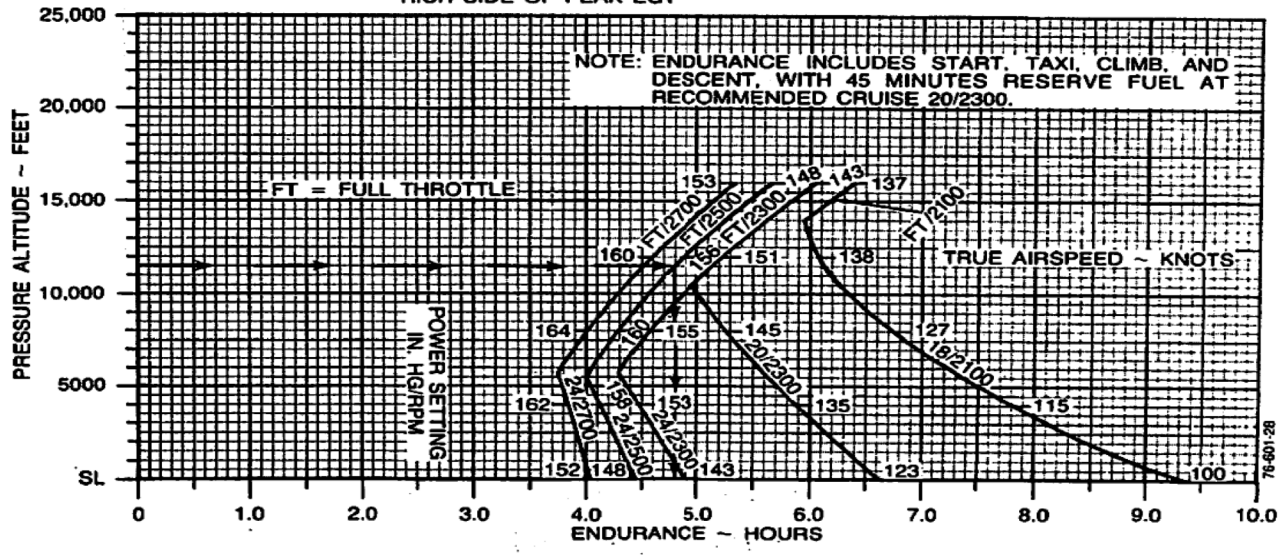
ENDURANCE PROFILE - 100 GALLONS
STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

WEIGHT	3916 LBS BEFORE ENGINE START
FUEL	AVIATION GASOLINE
FUEL DENSITY	6.0 LBS/GAL
INITIAL FUEL LOADING	100 US GAL (600 LBS)
COWL FLAPS	CLOSED
MIXTURE	LEANED TO 25°-50°F ON RICH SIDE OF PEAK EGT

EXAMPLE:

PRESSURE ALTITUDE	11,500 FT
POWER SETTING	FT/2500
ENDURANCE	4.8 HRS



HOLDING TIME

HOLDING TIME

APPLICABLE FOR ALL TEMPERATURES

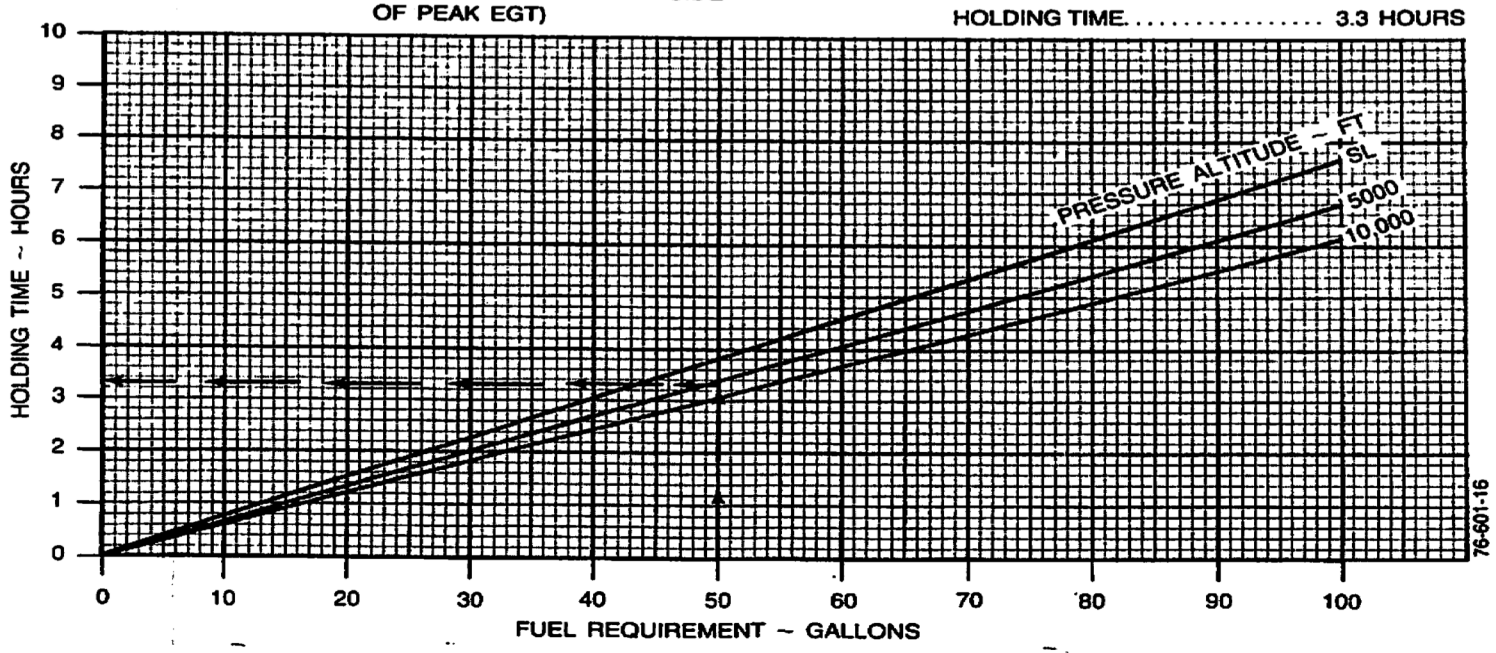
ASSOCIATED CONDITIONS:

POWER SETTING .....20 IN. HG OR FULL THROTTLE
2300 RPM
MIXTURE.....FULL RICH (ABOVE 5000 FT LEAN TO 75° - 100°F ON RICH SIDE OF PEAK EGT)

EXAMPLE:

FUEL AVAILABLE FOR HOLDING ..... 50 GALLONS
PRESSURE ALTITUDE..... 6000 FEET

HOLDING TIME..... 3.3 HOURS



TIME, FUEL, DISTACNE TO DESCEND

TIME, FUEL, AND DISTANCE TO DESCEND

DESCENT SPEED – 170 KNOTS

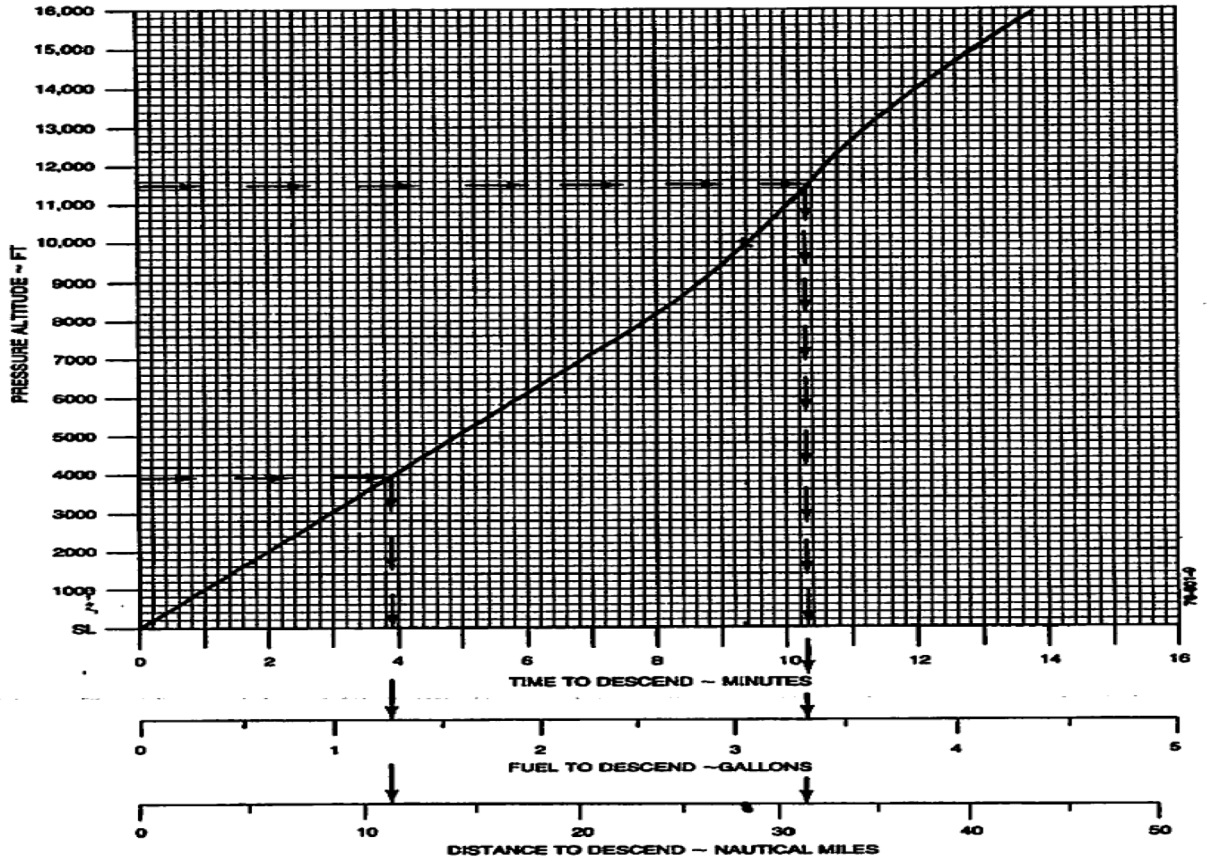
ASSOCIATED CONDITIONS:

POWER . . . . . AS REQUIRED TO MAINTAIN 1000 FT/MIN RATE OF DESCENT
LANDING GEAR . . . . UP
FLAPS . . . . . UP
MIXTURE . . . . . FULL RICH (ABOVE 5000 FT LEAN TO 75° - 100°F ON RICH SIDE OF PEAK EGT)

EXAMPLE:

INITIAL ALTITUDE . . . . . 11,500 FT
FINAL ALTITUDE . . . . . 3965 FT

TIME TO DESCEND . . . . . 10 – 4 = 6 MINUTES
FUEL TO DESCEND . . . . . 3.4 – 1.3 = 2.1 GAL
DISTANCE TO DESCEND . . . . 32 – 11 = 21NM



CLIMB BALKED LANDING

CLIMB - BALKED LANDING

CLIMB SPEED 71 KNOTS (ALL WEIGHTS)

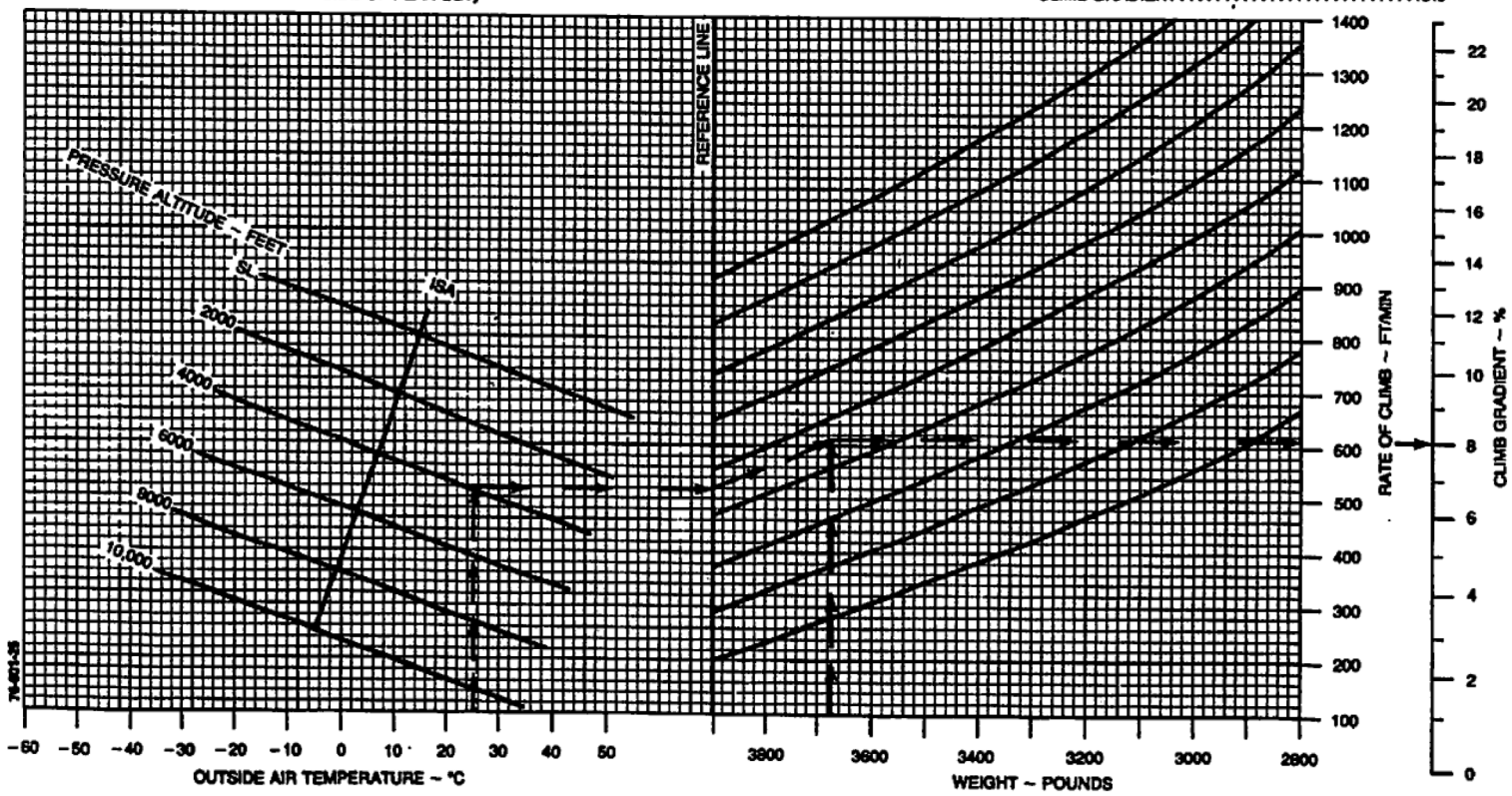
ASSOCIATED CONDITIONS:

POWER.....TAKE-OFF AT 2700 RPM
FLAPS.....DOWN (DN)
LANDING GEAR.....DOWN
MIXTURE.....FULL RICH (ABOVE 5000 FT LEAN TO 75° - 100°F ON RICH SIDE OF PEAK EGT)

EXAMPLE:

OAT.....25°C
PRESSURE ALTITUDE.....3965 FT
WEIGHT.....3677 LBS

RATE OF CLIMB.....610 FT/MIN
CLIMB GRADIENT.....8%



LANDING DISTACNE FLAPS DOWN

LANDING DISTANCE - FLAPS DOWN (DN)

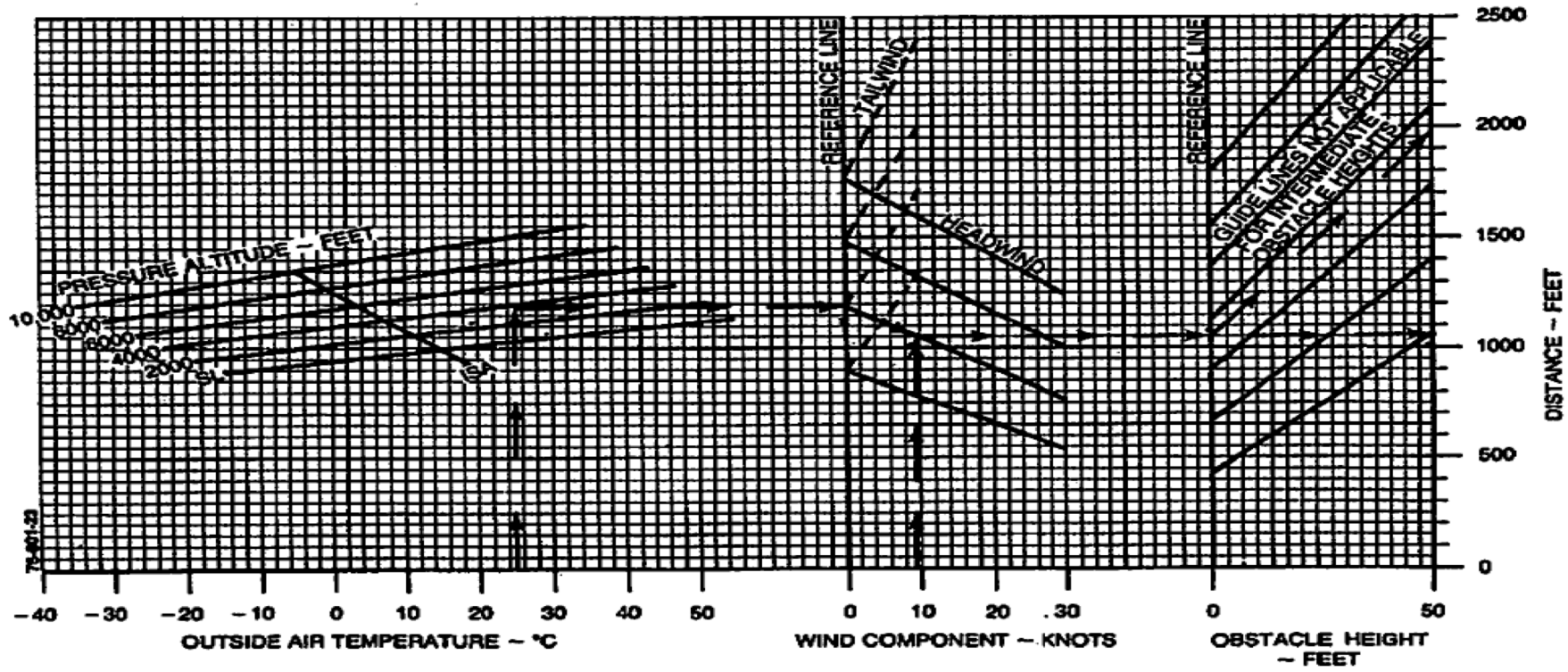
APPROACH SPEED 76 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

POWER	RETARD TO MAINTAIN 600 FT/MIN ON FINAL APPROACH
FLAPS	DOWN (DN)
LANDING GEAR	DOWN
RUNWAY	PAVED, LEVEL, DRY SURFACE
APPROACH SPEED	76 KNOTS IAS
BRAKING	MAXIMUM

EXAMPLE:

OAT	25°C
PRESSURE ALTITUDE	3965 FT
HEADWIND COMPONENT	9.5 KTS
GROUND ROLL	1050 FT
TOTAL OVER 50 FT OBSTACLE	1970 FT
APPROACH SPEED	76 KTS



LANDING DISTANCE FLAPS UP

LANDING DISTANCE - FLAPS UP

APPROACH SPEED 87 KNOTS (ALL WEIGHTS)

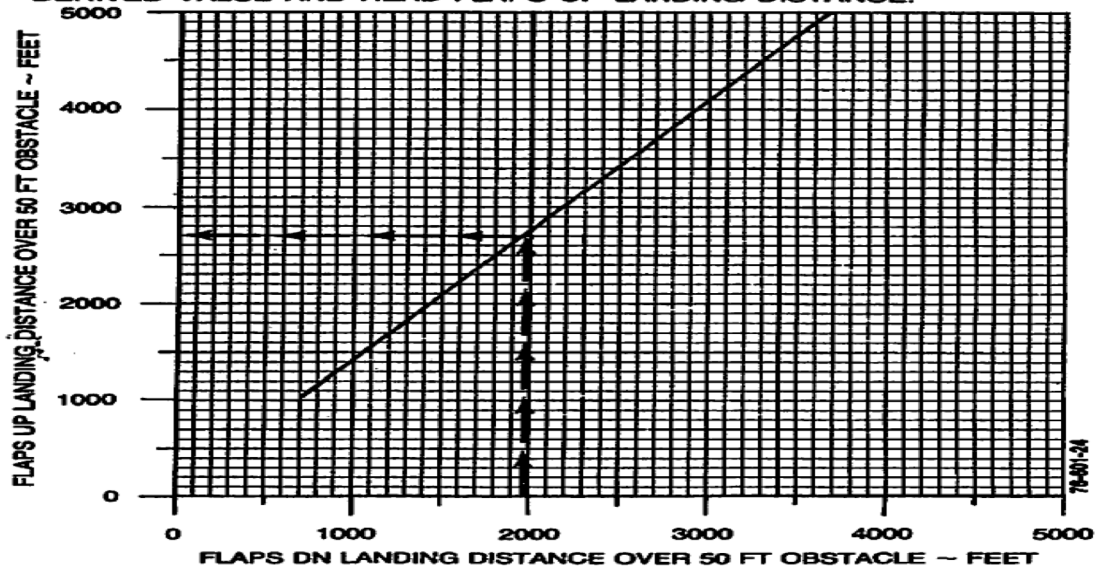
ASSOCIATED CONDITIONS:

POWER	RETARD TO MAINTAIN 600 FT/MIN ON FINAL APPROACH
FLAPS	UP
LANDING GEAR	DOWN
RUNWAY	PAVED, LEVEL, DRY SURFACE
APPROACH SPEED	87 KNOTS IAS
BRAKING	MAXIMUM

EXAMPLE:

FLAPS DN LANDING DISTANCE OVER 50 FT OBSTACLE	1970 FT
FLAPS UP LANDING DISTANCE OVER 50 FT OBSTACLE	2700 FT
APPROACH SPEED	87 KTS

NOTE:
1. LANDING WITH FLAPS FULL DOWN IS NORMAL PROCEDURE. USE THIS GRAPH WHEN IT IS NECESSARY TO LAND WITH FLAPS UP.
2. TO DETERMINE FLAPS UP LANDING DISTANCE, READ FROM THE LANDING DISTANCE - FLAPS DOWN GRAPH, THE LANDING DISTANCE APPROPRIATE TO OAT, ALTITUDE, WIND, AND 50 FT OBSTACLE. ENTER THIS GRAPH WITH DERIVED VALUE AND READ FLAPS UP LANDING DISTANCE.



LANDING DISTACNE SOFT FIELD

LANDING DISTANCE - GRASS SURFACE - FLAPS DOWN (DN)

APPROACH SPEED 76 KTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

POWER . . . . . RETARD TO MAINTAIN 600 FT/MIN ON FINAL APPROACH
FLAPS . . . . . DOWN (DN)
LANDING GEAR . . DOWN
RUNWAY . . . . . SHORT, DRY, GRASS
APPROACH SPEED . . . . . 76 KTS
BRAKING . . . . . MAXIMUM

EXAMPLE:

OAT . . . . . 25°C
PRESSURE ALTITUDE . . . . . 3985 FT
HEADWIND COMPONENT . . . . . 9.5 KTS

GROUND ROLL . . . . . 1250 FT
TOTAL OVER 50 FT OBSTACLE . . . . . 2150 FT
APPROACH SPEED . . . . . 76 KTS