

APPLICATION PRACTICE AND PERFORMANCE



Goals of this unit

- ✓ Enlarge the vocabulary technical and know the importance of their concepts.
- ✓ Find out the importance of the data obtained during the process of weight and swinging for a operation efficient and safe.
- ✓ Identify the factors external and their effects during the operation of a UAV.
- ✓ Interpret the parts basic of tables, cards and forms of performance of a aircraft.

Introduction

During this class We will see the importance of the data that We got during he process of weight and swinging of the UAV.

So same, We will include further amount of data for the realization of a flight sure and efficient.

For discover as us serve the data of weight, swinging and performance in the operation of a UAVwe will do drills of operations.

In general , we will imagine that we are going to pilot a class E fixed wing , with 2 gasoline engines , since inrelationship to the propelled with engines electrical the that are to combustion internal They usually have elderlyautonomy and reach older heights of flight.

Besides We will have in account operations in conditions atmospheric ISA

Concepts initials



International Standard Atmosphere (ISA):

This atmosphere defined by the ICAO, possesses conditions hypothetical that serve as a pattern of reference for the realization of calculations of performance.

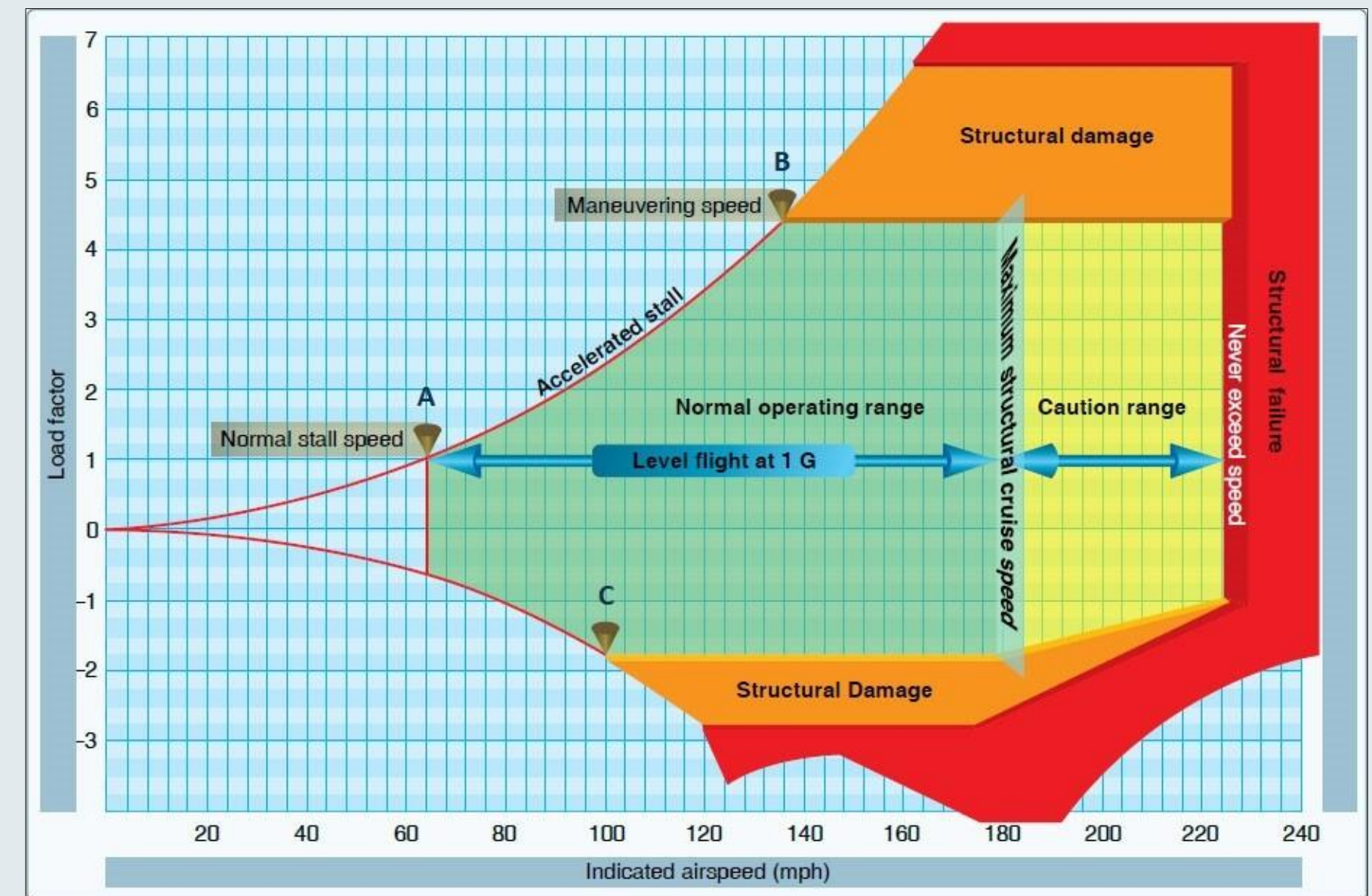
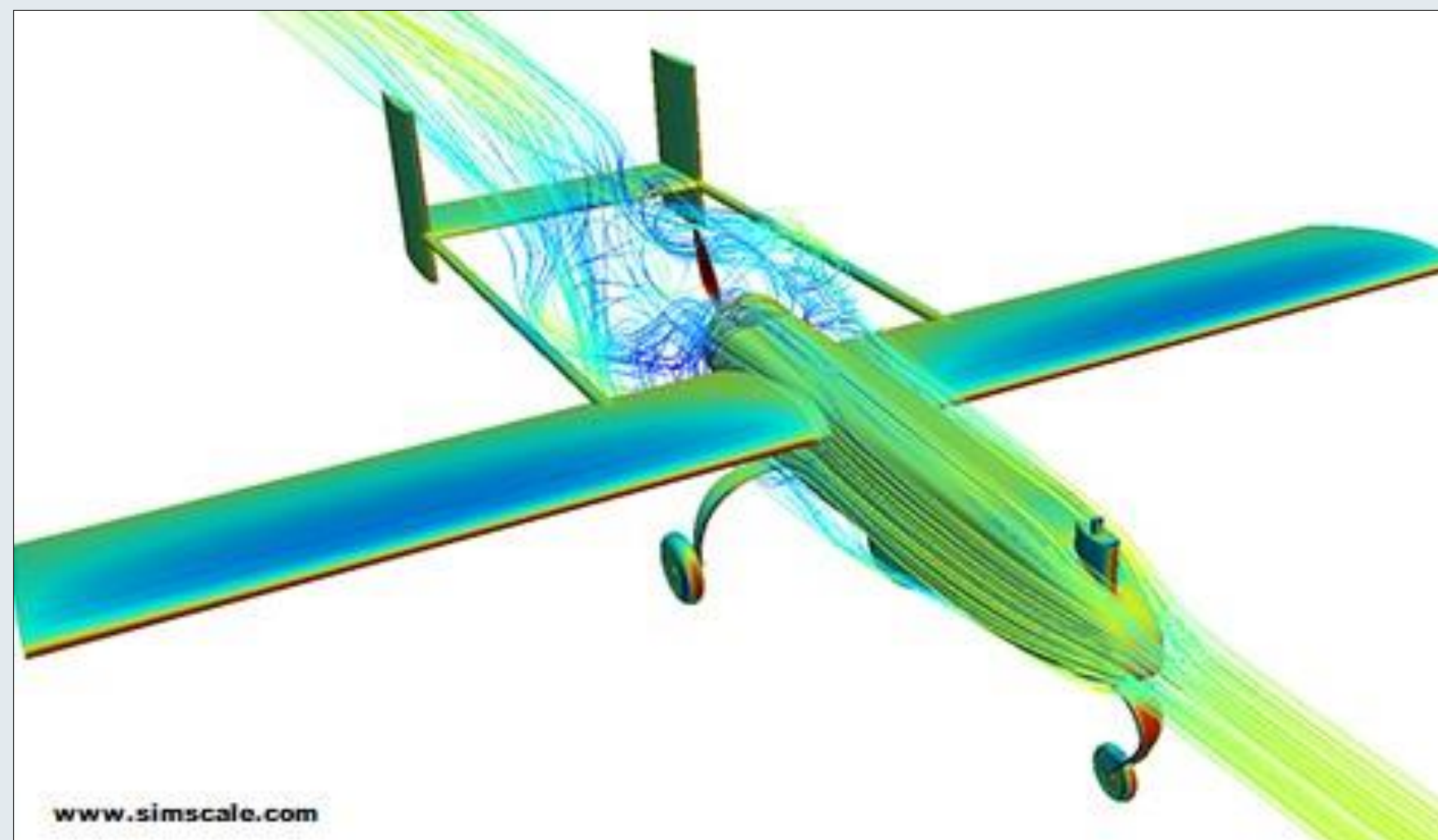
Their values constants assumed to the level half of these are the following :

- Temperature: 15°C
- Pressure: 1013.25hPa
- Gradient thermal: -6.5°C each 1,000mts
- Decline of pressure atmospheric: 110hPa each 1,000mts.

ALTITUD m	PRESIÓN bar	TEMPERATURA °C
0	1.013	15.0
100	1.001	14.4
200	0.989	13.7
300	0.987	13.1
400	0.966	12.4
500	0.955	11.8
600	0.945	11.1
800	0.921	9.8
1.000	0.899	8.5
1.200	0.877	7.2
1.400	0.856	5.9
1.600	0.835	4.6
1.800	0.815	3.3
2.000	0.795	2.0
2.200	0.775	0.7
2.400	0.756	-0.6
2.600	0.737	-1.9
2.800	0.719	-3.2
3.000	0.701	-4.5
3.200	0.683	-5.8
3.400	0.666	-7.1
3.600	0.649	-8.4
3.800	0.633	-9.7
4.000	0.616	-11.0

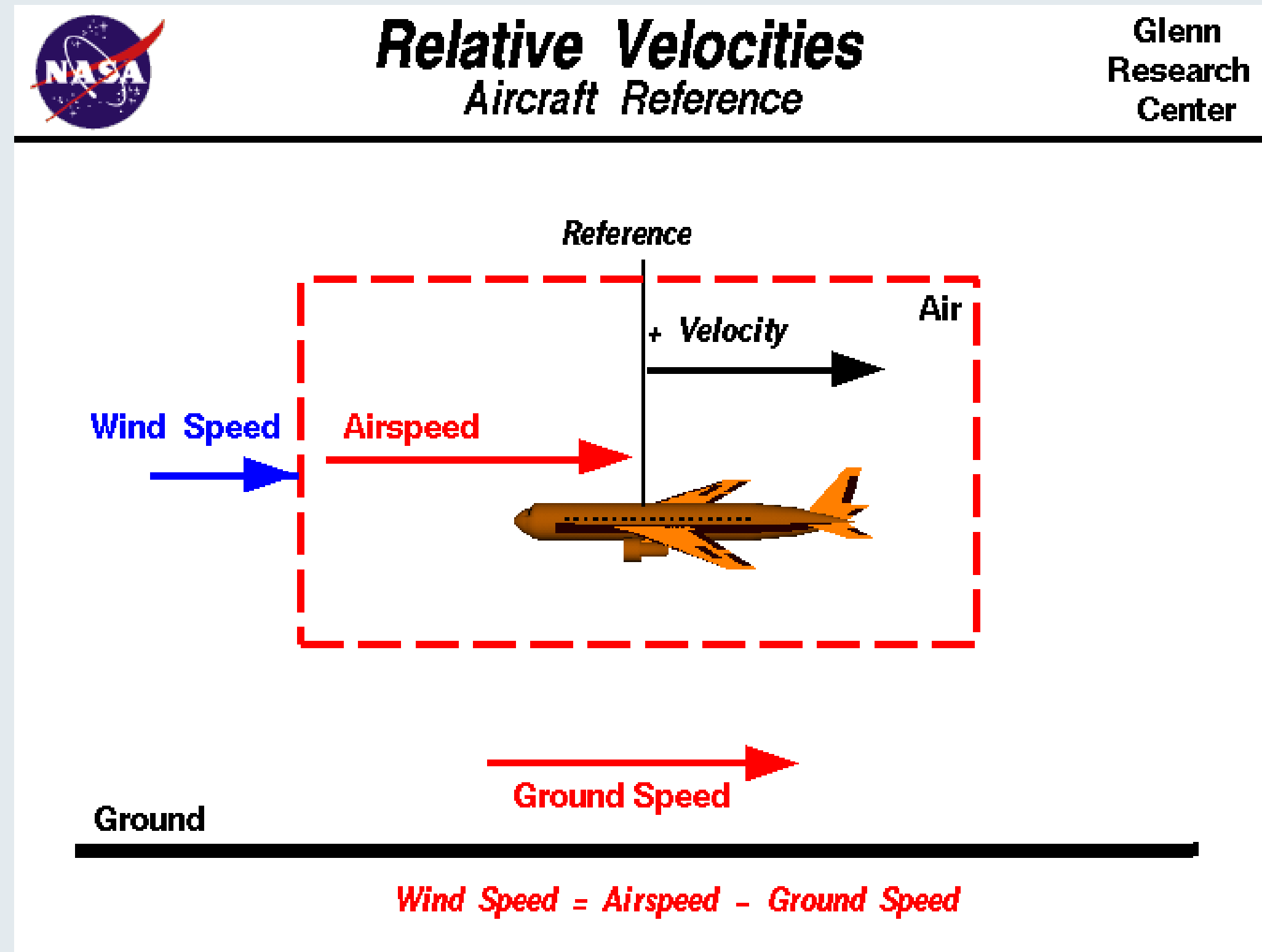
Concepts initials

- **Performance either Performance:** Is he set of capabilities offered by a UAV of agreement with he aim for he which ha been designed.
- **Factor of burden (“G”):** Is the relationship that exists between the force aerodynamics that supports a apparatus in flight divided its weight.



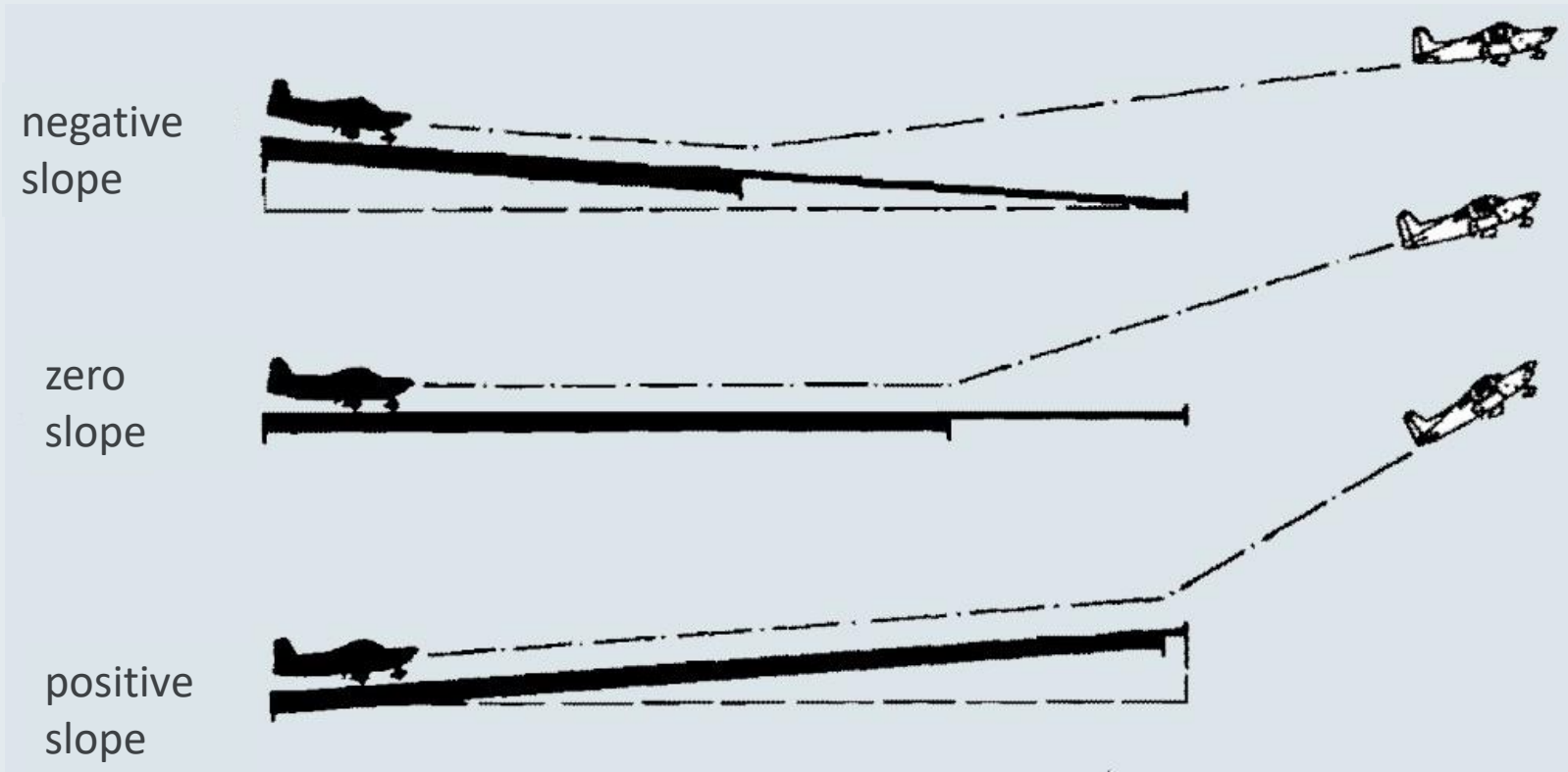
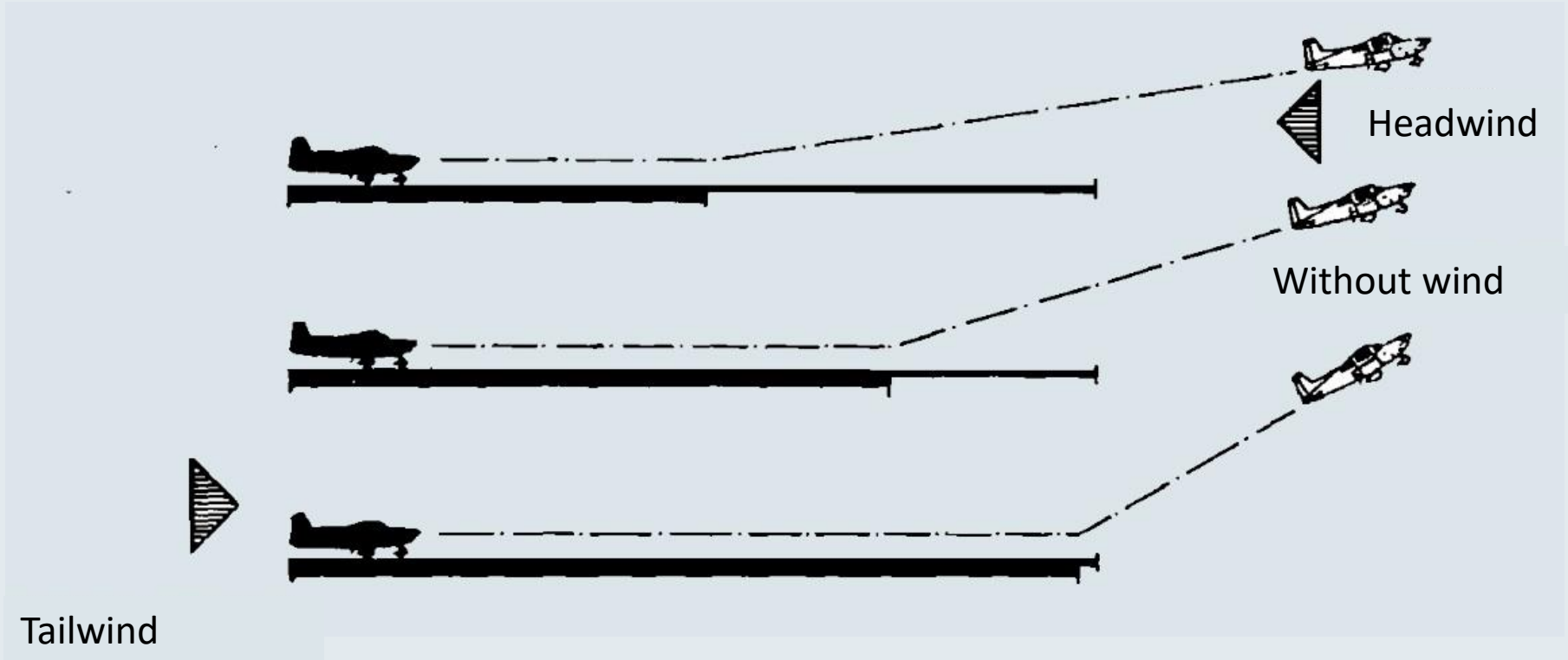
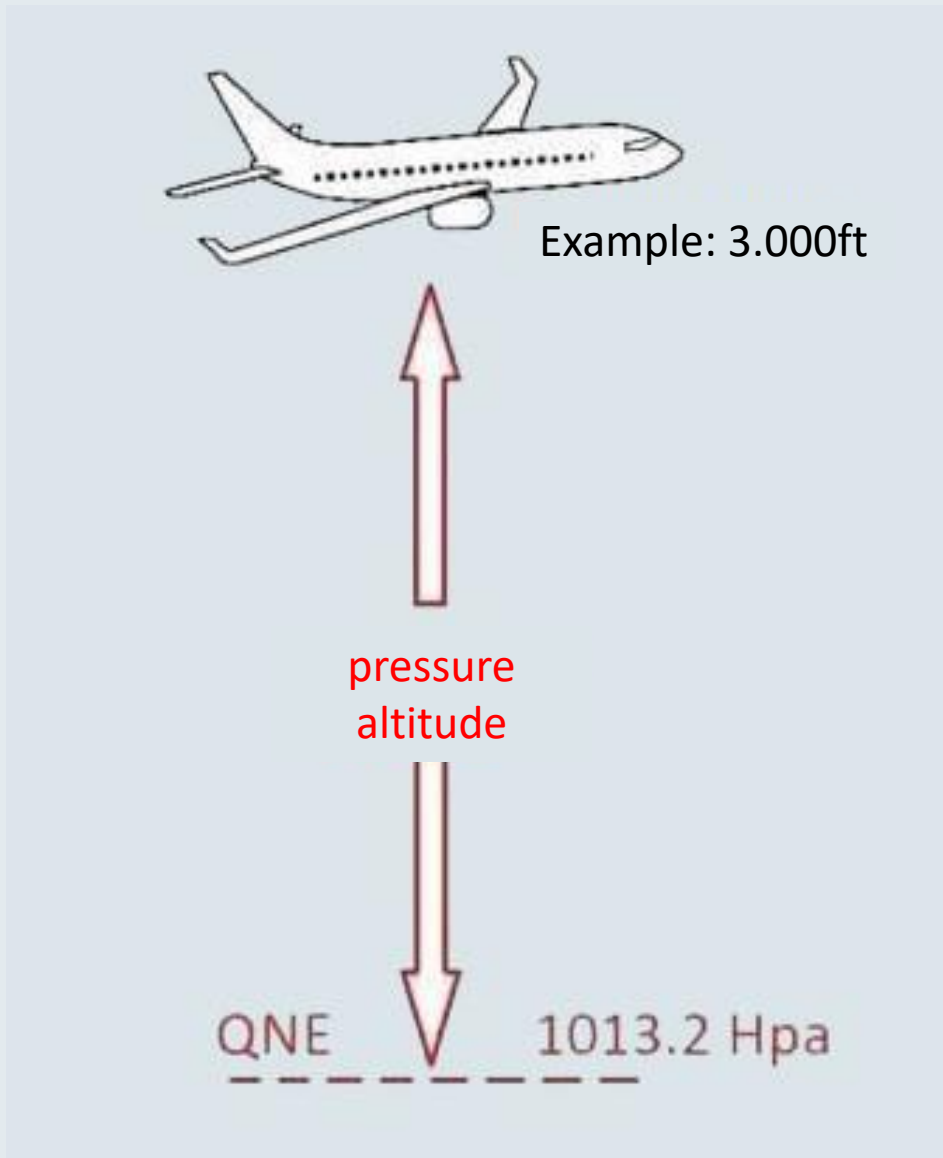
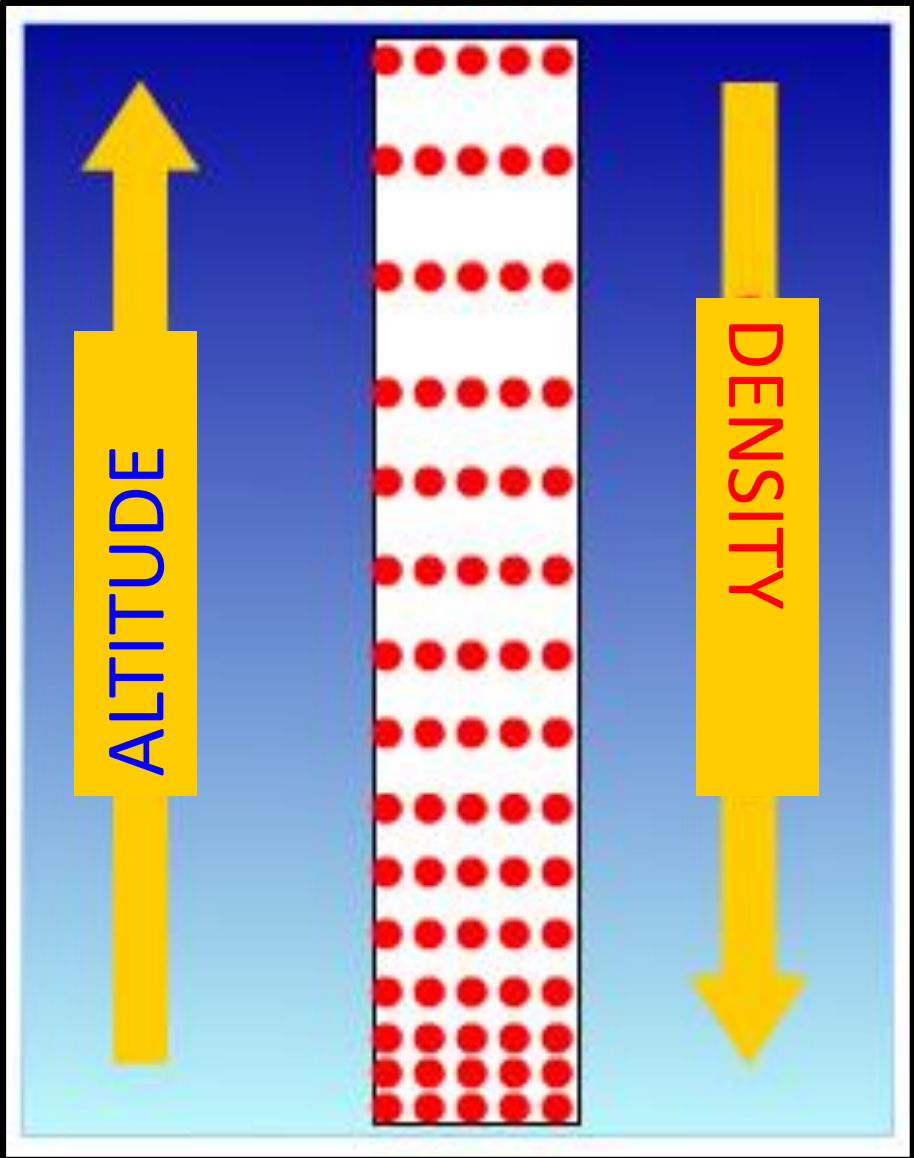
Concepts initials

➤ Velocity:



Concepts initials

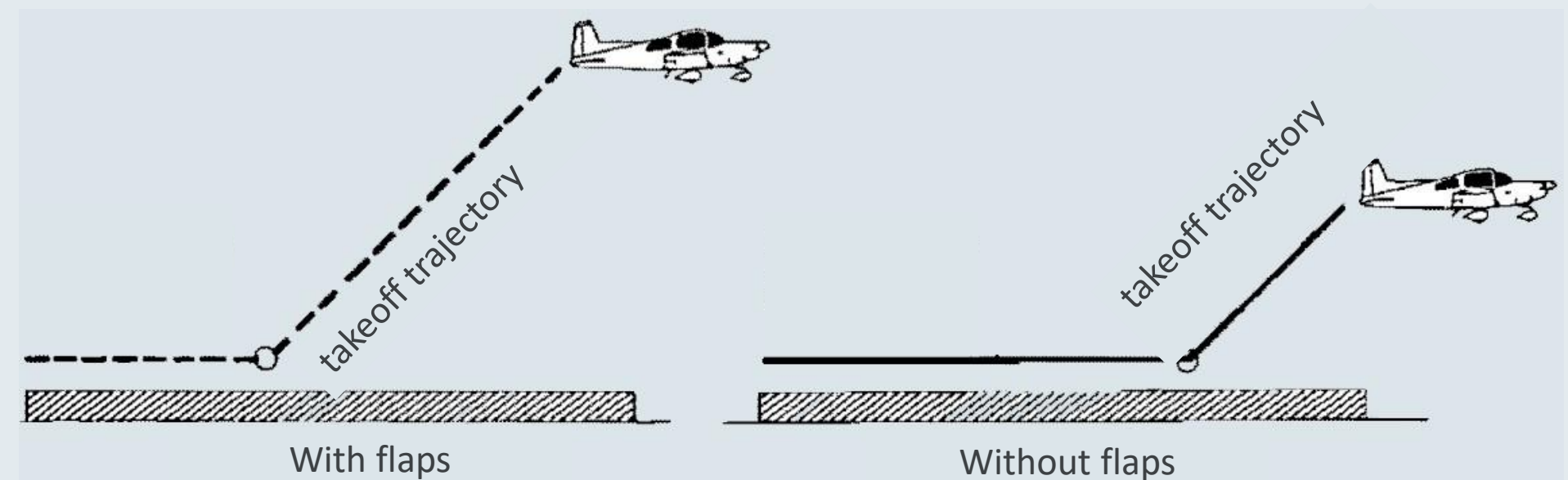
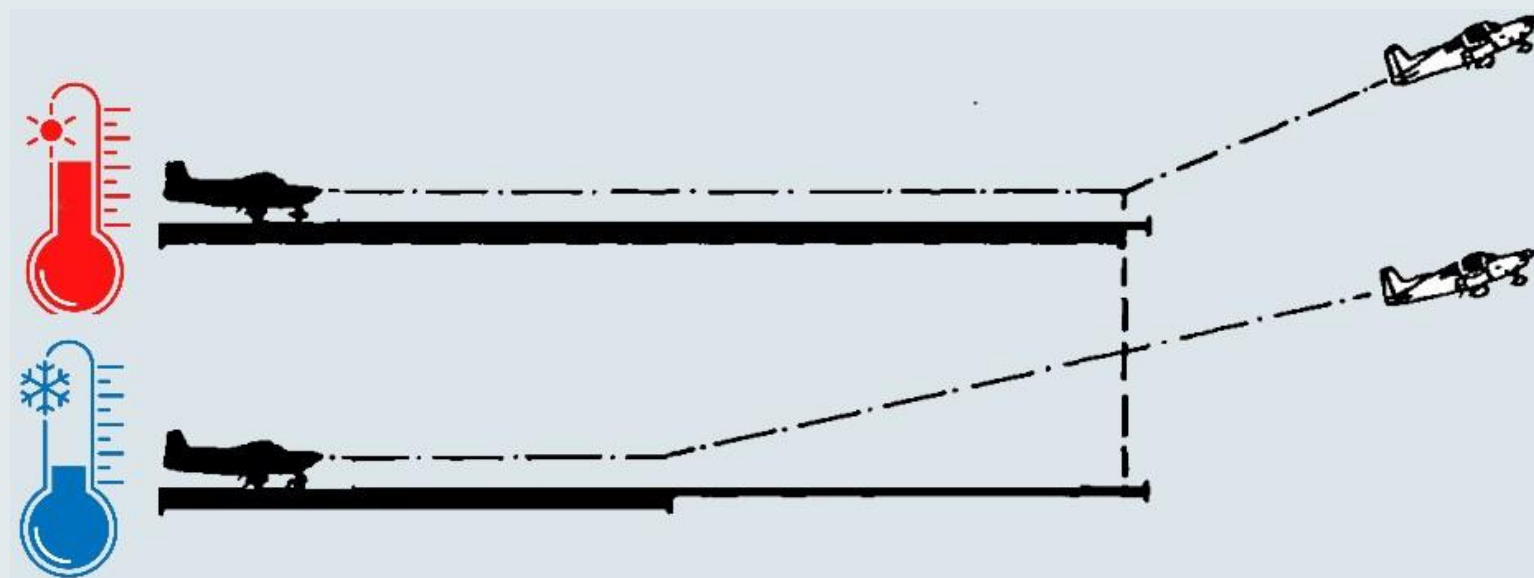
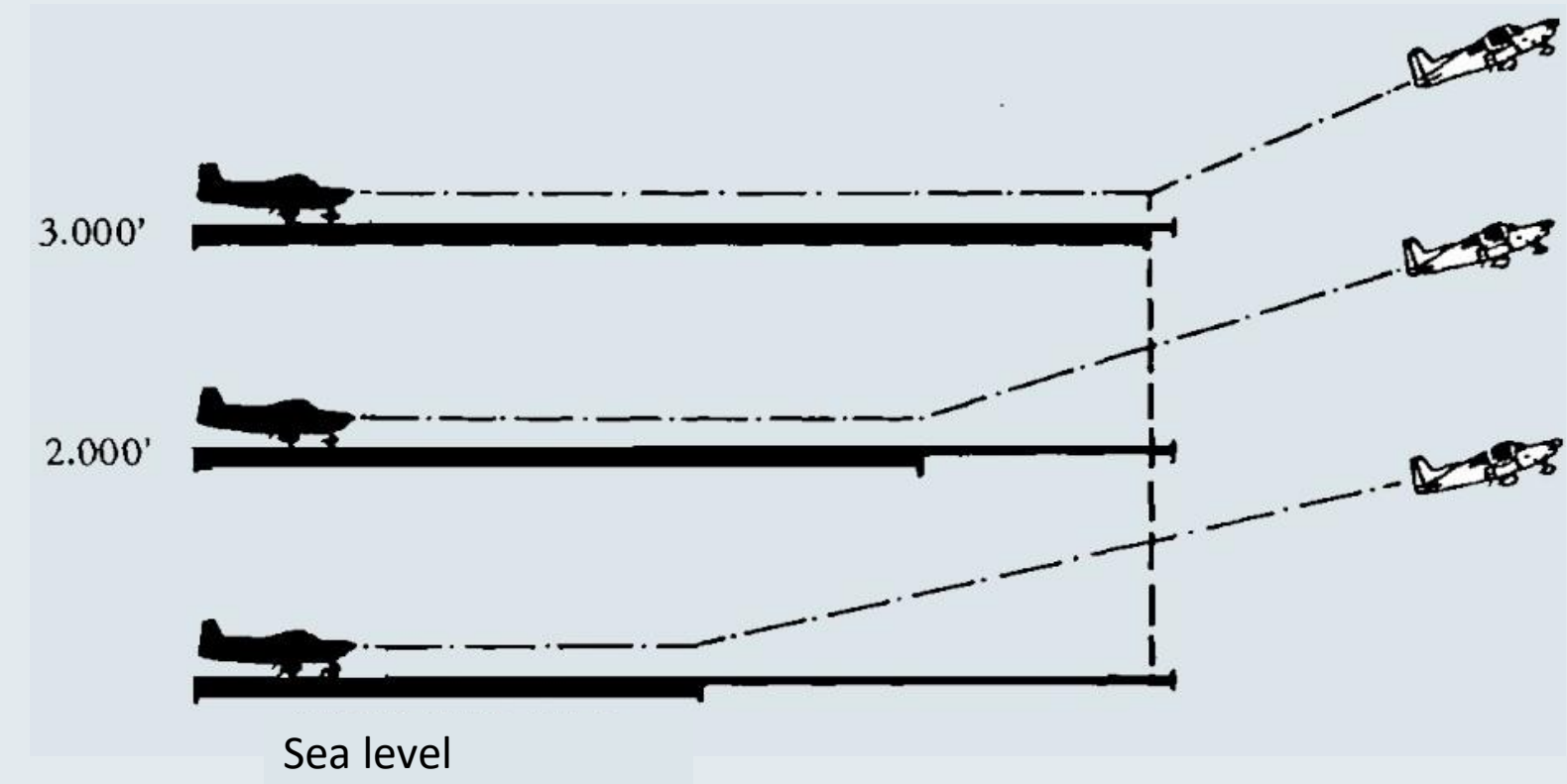
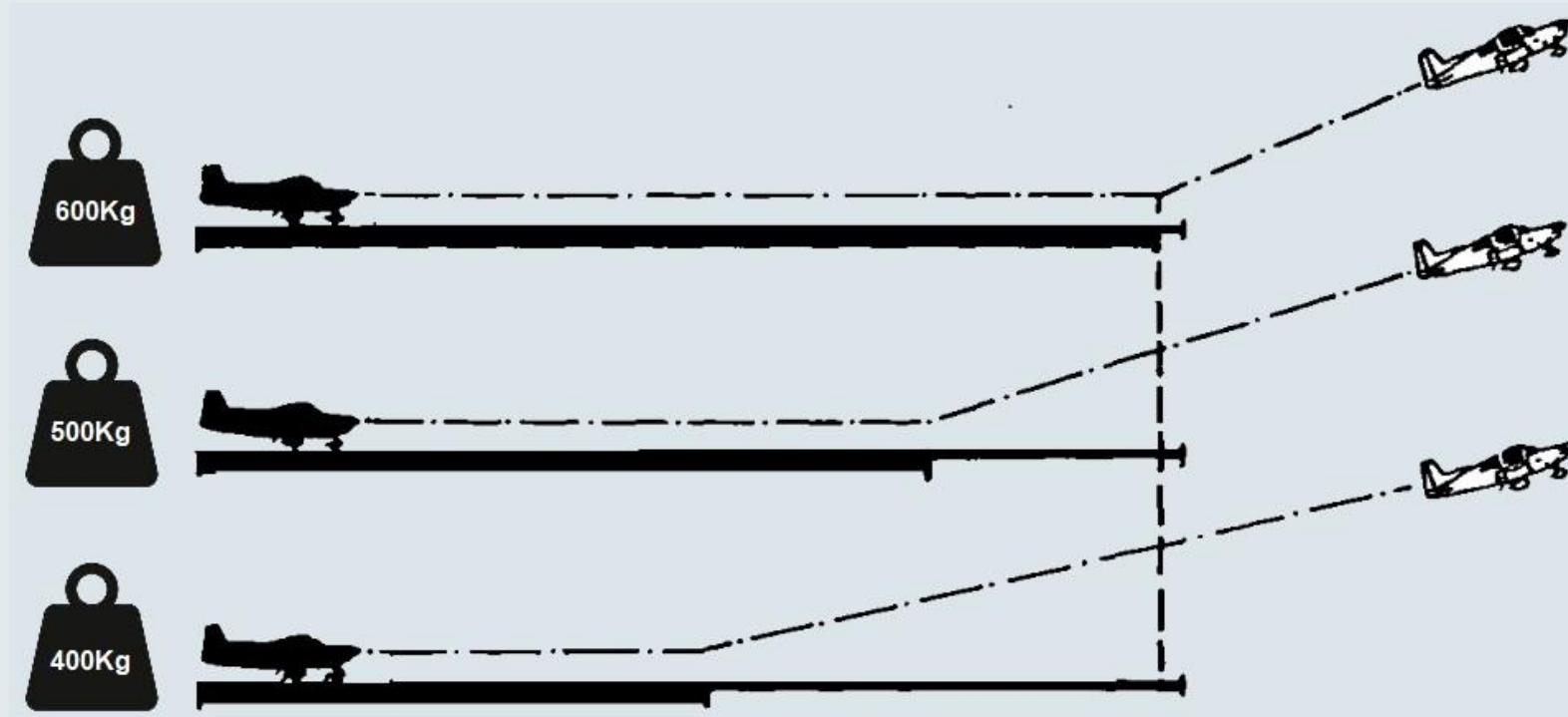
A UAV will suffer during their operations different effects due to factors external to he. Some of the factors and their consequences are the following :



$$\text{DENSITY ALTITUDE} = \text{PA} + (\text{OAT} - \text{ISA T}) \times 120$$

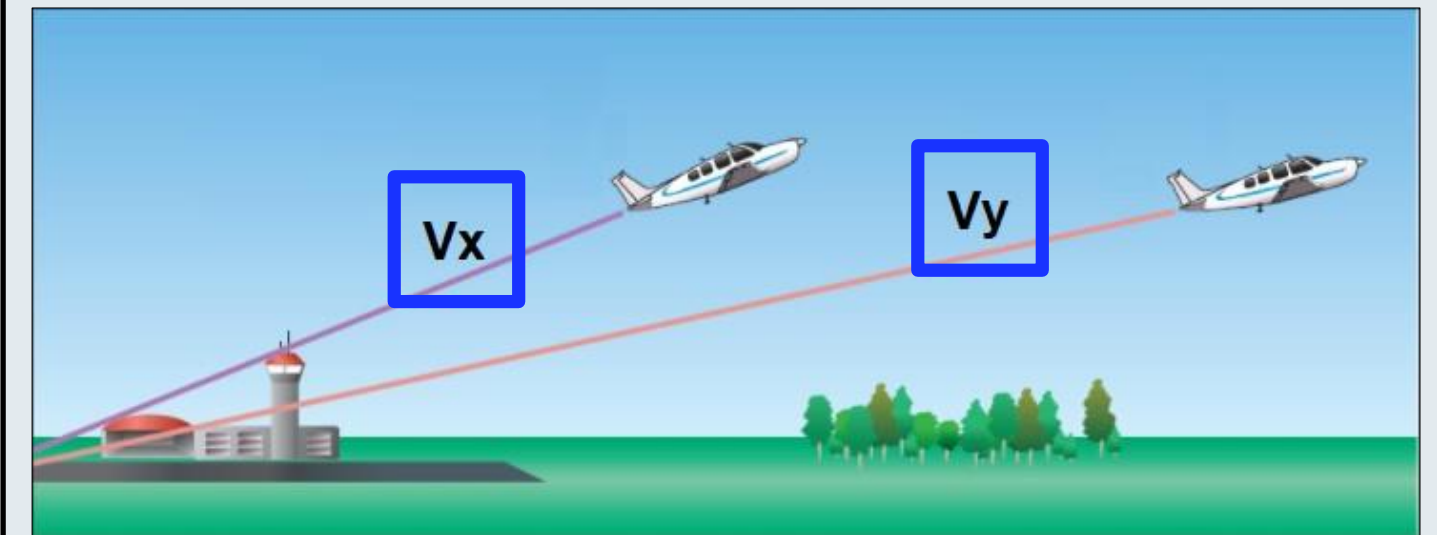
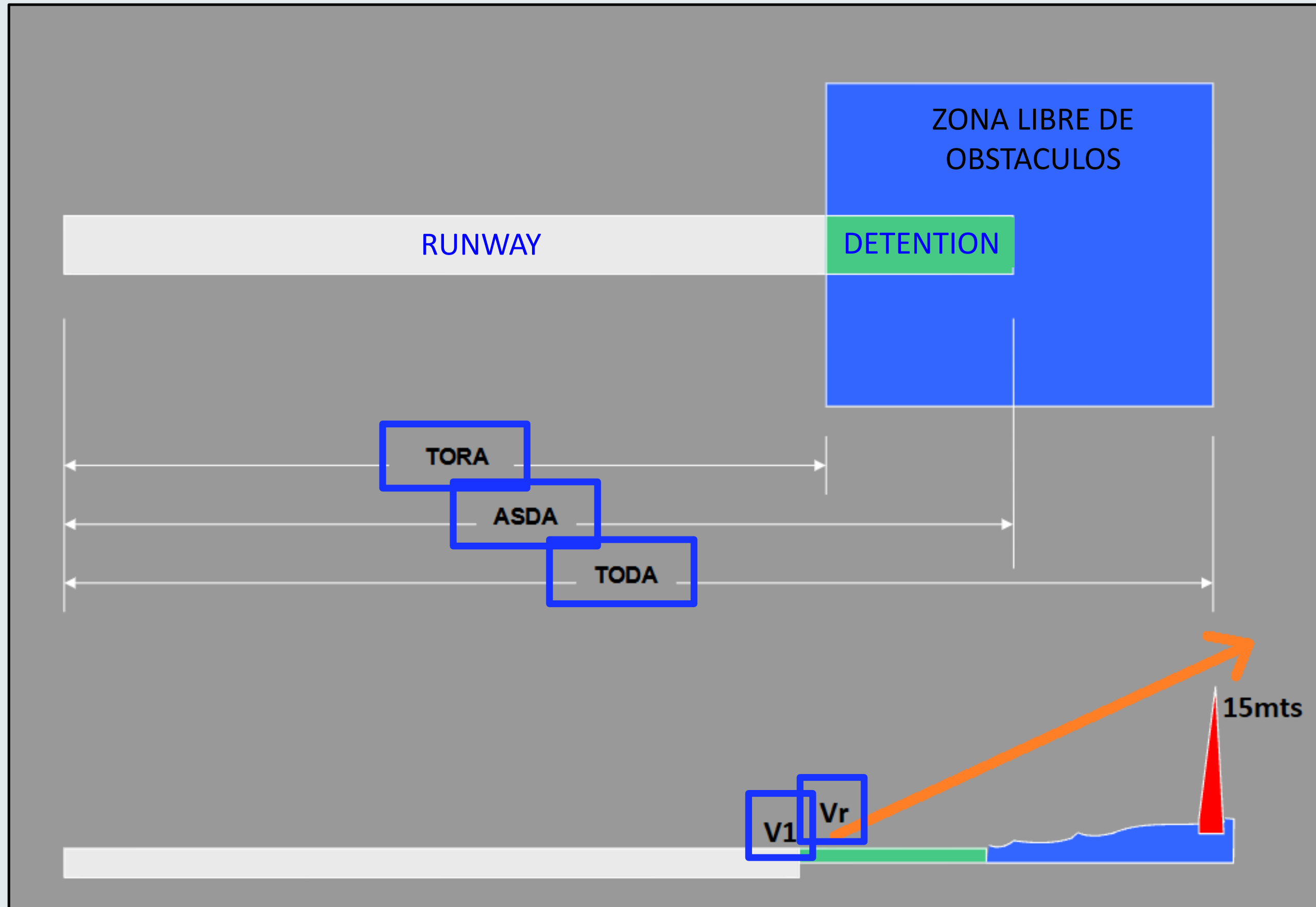
Dynamic of data: Takeoff and Ascent

For specify of manner safe and optimal he takeoff we will take in account some data :



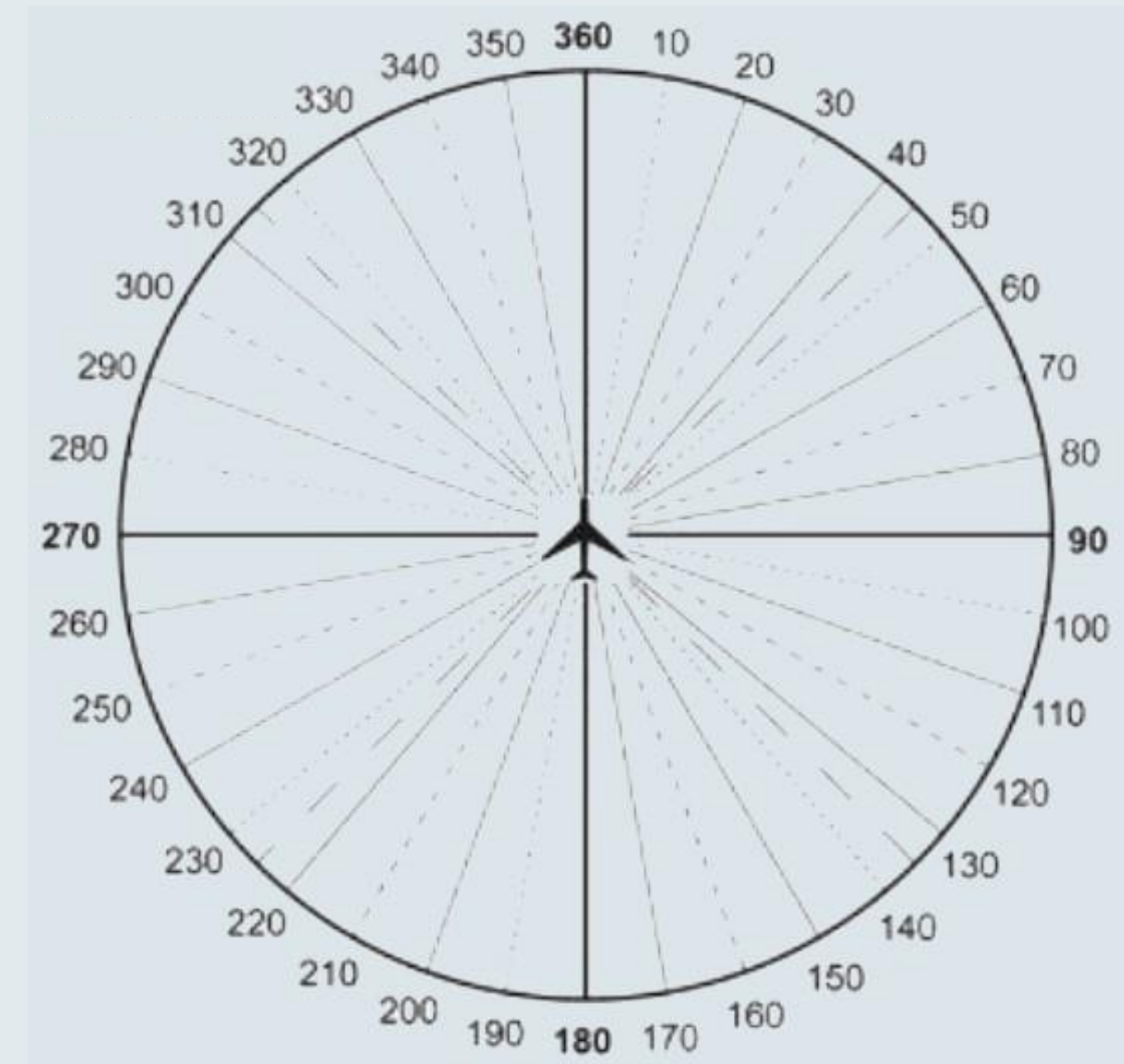
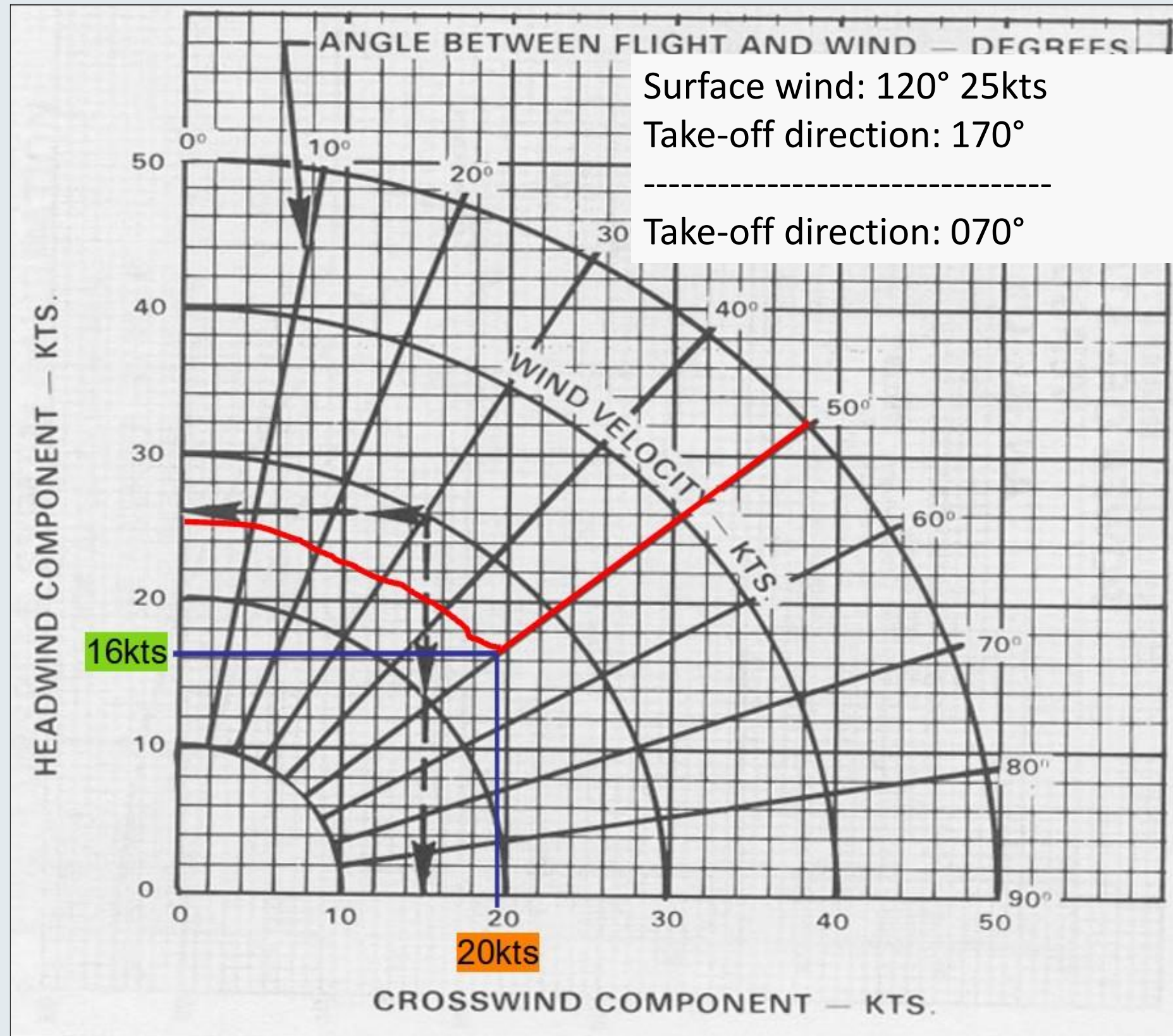
Dynamic of data: Takeoff and Ascent

And, now, We will need calculate others data further :



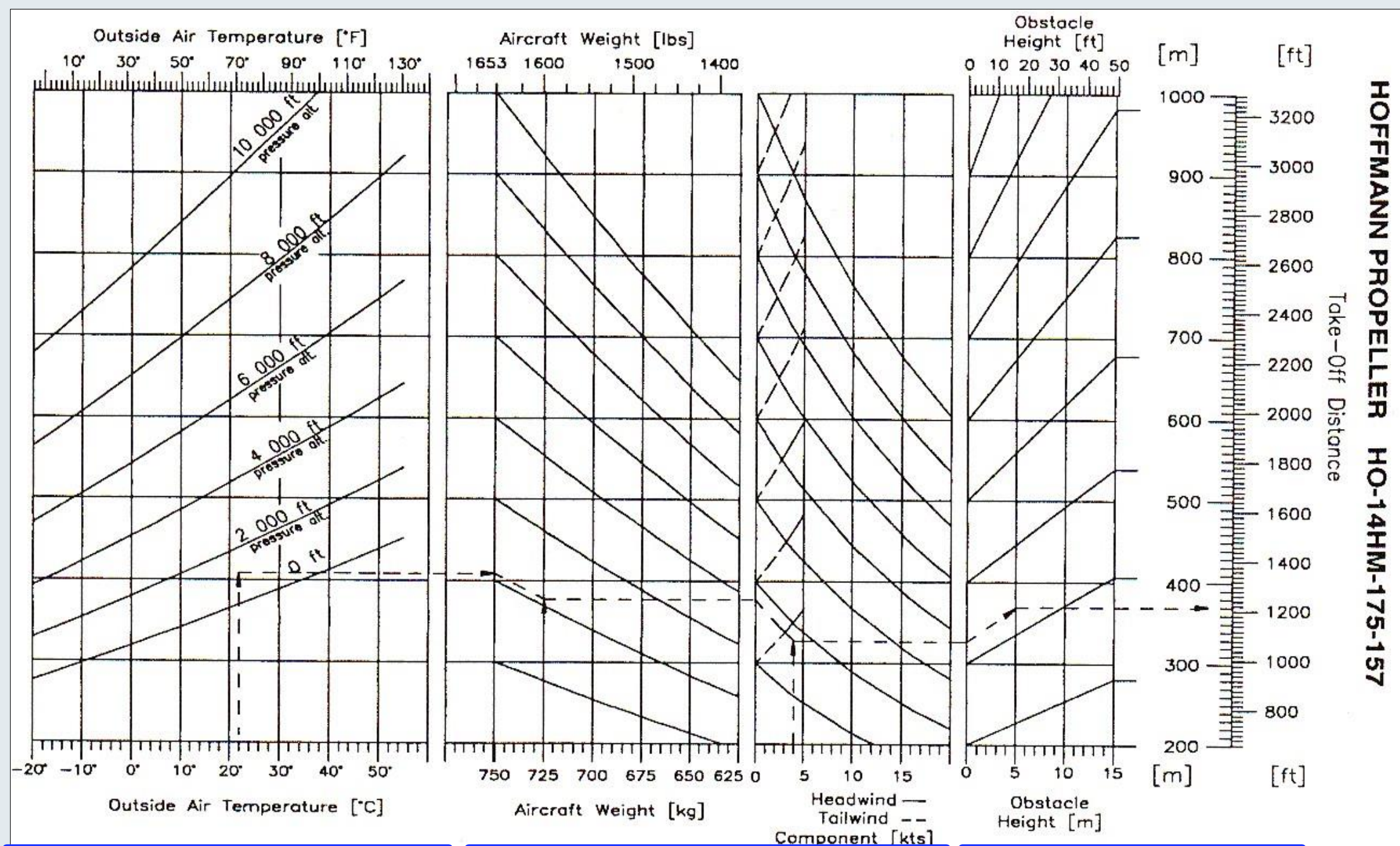
Dynamic of data: Takeoff and Ascent

Putting in practice :



Dynamic of data: Takeoff and Ascent

Putting in practice :



Conditions:

- Maximum take-off power
- Lift-off speed 52 KIAS and speed for climb over obstacle 58 KIAS
- Level runway, paved
- Wing Flaps in T/O position

Example:

- Pressure altitude: 1000 ft.
- Outside temperature: 72° F (22° C)
- Weight: 1600 lbs (725 kg)
- Wind: 4 kt headwind

Result:

- Take-off distance to clear a 16 ft (5m) obstacle: 1214 ft (370m)

NOTE

Poor maintenance condition of the airplane, deviation from the given procedures as well as unfavorable conditions (i.e. high temperature, rain, unfavorable wind conditions, including cross wind) can increase the take-off distance considerably

TAKEOFF DISTANCE - FLAPS RETRACTED - HARD SURFACE RUNWAY										
GROSS WIGHT LBS.	IAS 50 FT. MPH	HEAD WIND KNOTS	AT SEA LEVEL 15°C		AT 2500 FT. 10°C		AT 5000 FT. 5°C		AT 7500 FT. 0°C	
			GROUND RUN	TOTAL TO CLEAR 50 FT. OB.ST.	GROUND RUN	TOTAL TO CLEAR 50 FT. OB.ST.	GROUND RUN	TOTAL TO CLEAR 50 FT. OB.ST.	GROUND RUN	TOTAL TO CLEAR 50 FT. OB.ST.
1620	70	0	730	1385	910	1650	1135	1985	1360	2440
		10	500	1035	630	1250	780	1510	975	1875
		20	300	730	390	890	510	1090	640	1375

Increase the distances 10% per each 15°C increase the temperatura above standard for the particular altitude. For operation on a grass runway increase the distance 7%.

CONDITIONS: SECTION 5 PERFORMANCE CESSNA MODEL 172R

Flaps Up
Full Throttle
Standard Temperature

TIME, FUEL AND DISTANCE TO CLIMB AT 2450 POUNDS

PRESS ALT FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME IN MIN	FUEL USED GAL	DIST NM
S.L.	15	79	720	0	0.0	0
1000	13	78	670	1	0.4	2
2000	11	77	625	3	0.7	4
3000	9	76	575	5	1.2	6
4000	7	76	560	6	1.5	8
5000	5	75	515	8	1.8	11
6000	3	74	465	10	2.1	14
7000	1	73	415	13	2.5	17
8000	-1	72	365	15	3.0	21
9000	-3	72	315	18	3.4	25
10,000	-5	71	270	22	4.0	29
11,000	-7	70	220	26	4.6	35
12,000	-9	69	170	31	5.4	43

NOTES:

1. Add 1.1 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture leaned above 3000 feet for maximum RPM.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

Dynamic of data: Cruise

Putting in practice :

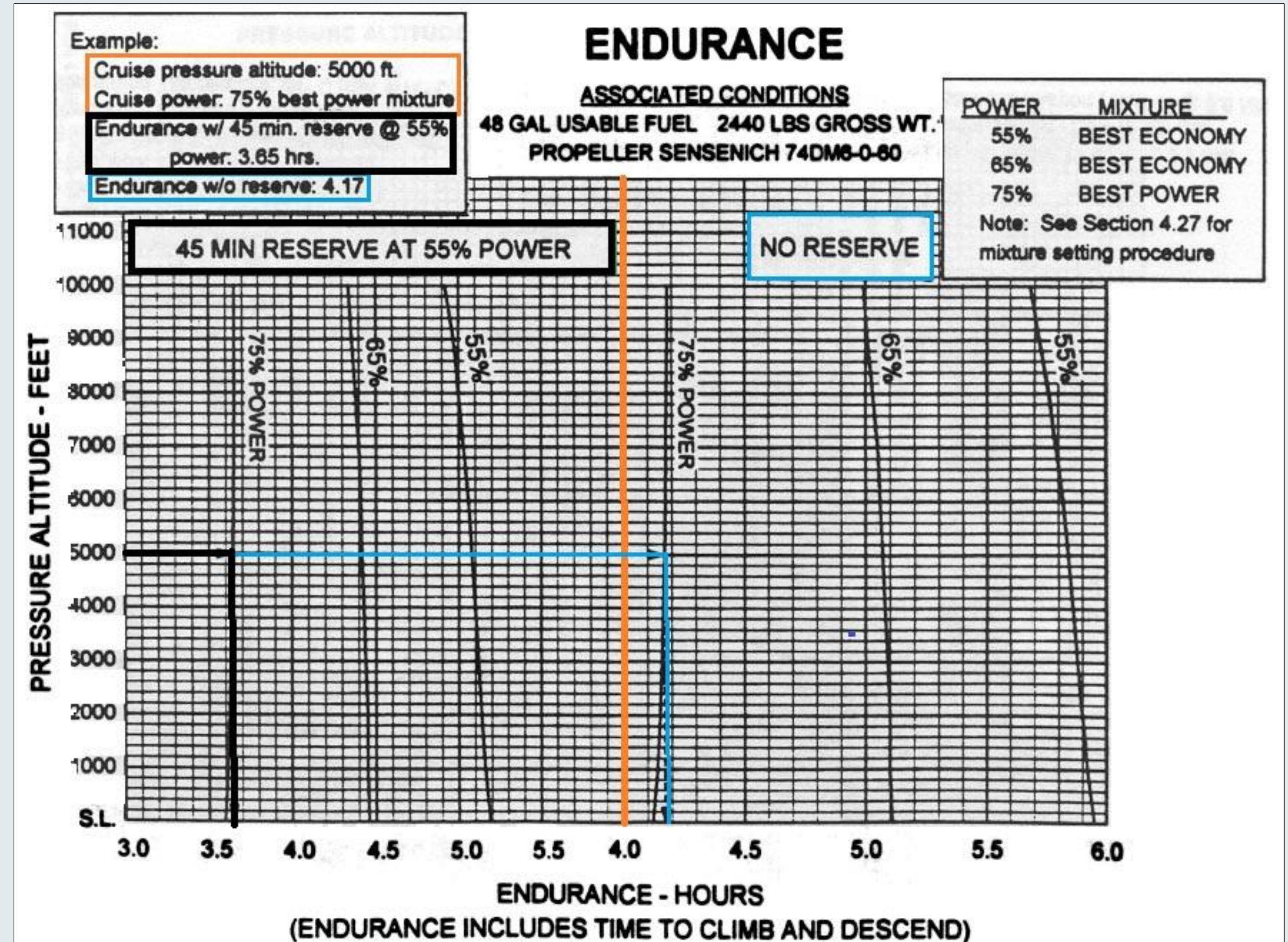
CONDITIONS:
2650 Pounds
Recommended Lean Mixture

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

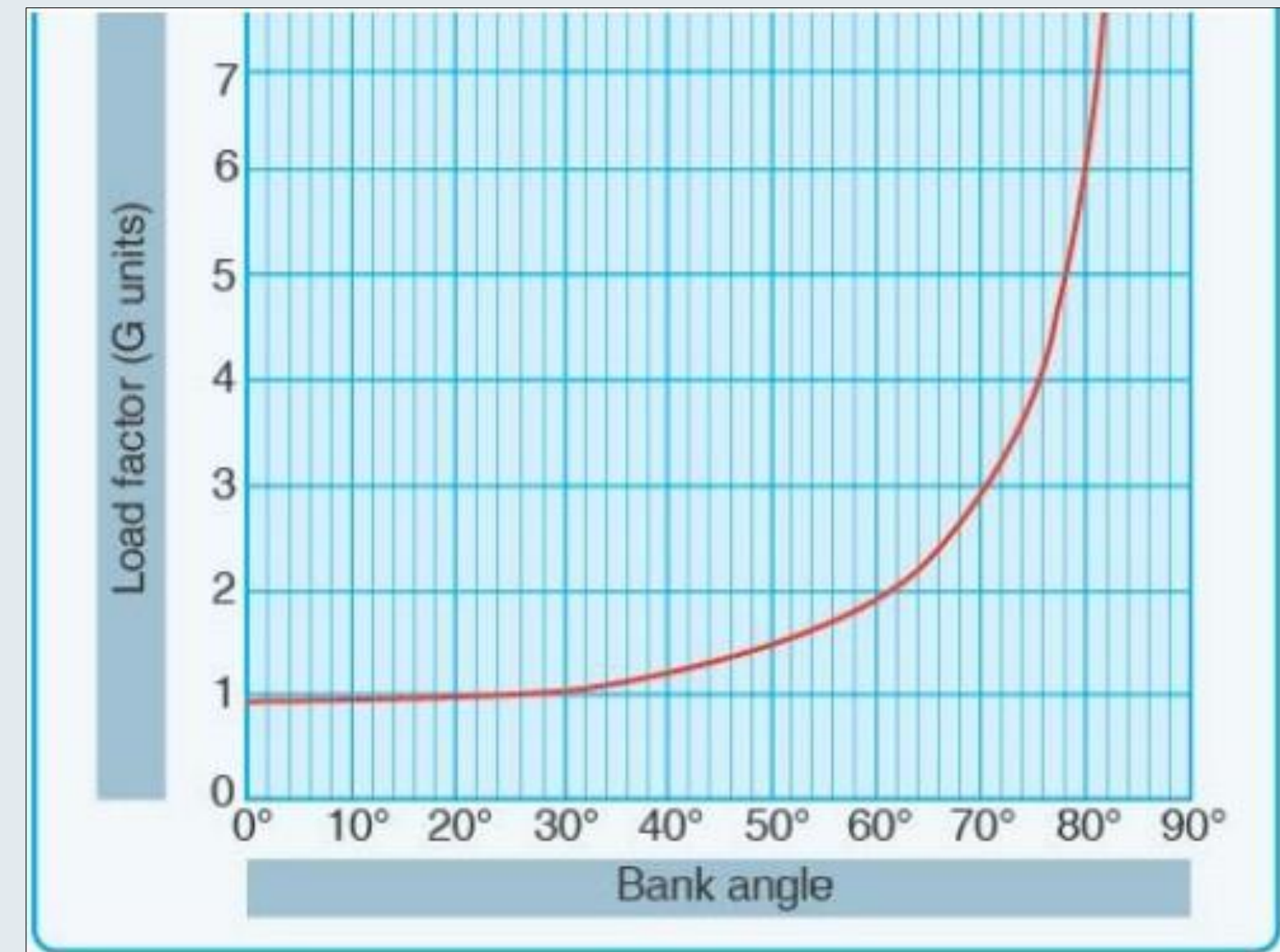
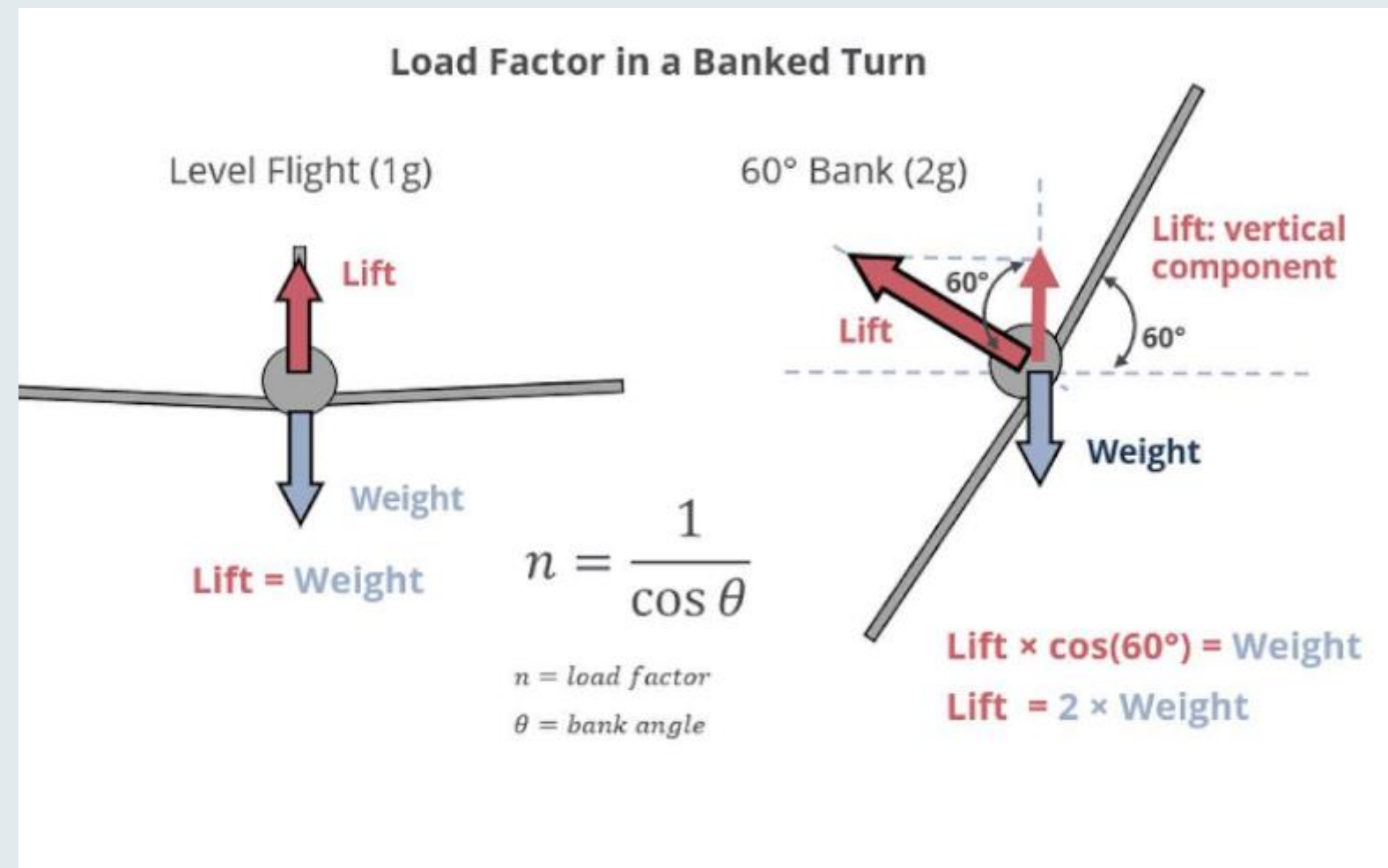
RPM	20°C BELOW STANDARD TEMP -9°C		STANDARD TEMPERATURE 11°C		20°C ABOVE STANDARD TEMP 31°C	
	KTAS	GPH	KTAS	GPH	KTAS	GPH
2500	130	10.3	131	9.9	132	9.6
2400	128	9.9	129	9.6	130	9.3
2300	123	9.0	123	8.7	123	8.5
2200	117	8.2	116	7.9	116	7.7
2100	105	6.9	103	6.7	101	6.6

Figure 5-7: Cruise Performance (Sheet 1 of 6)



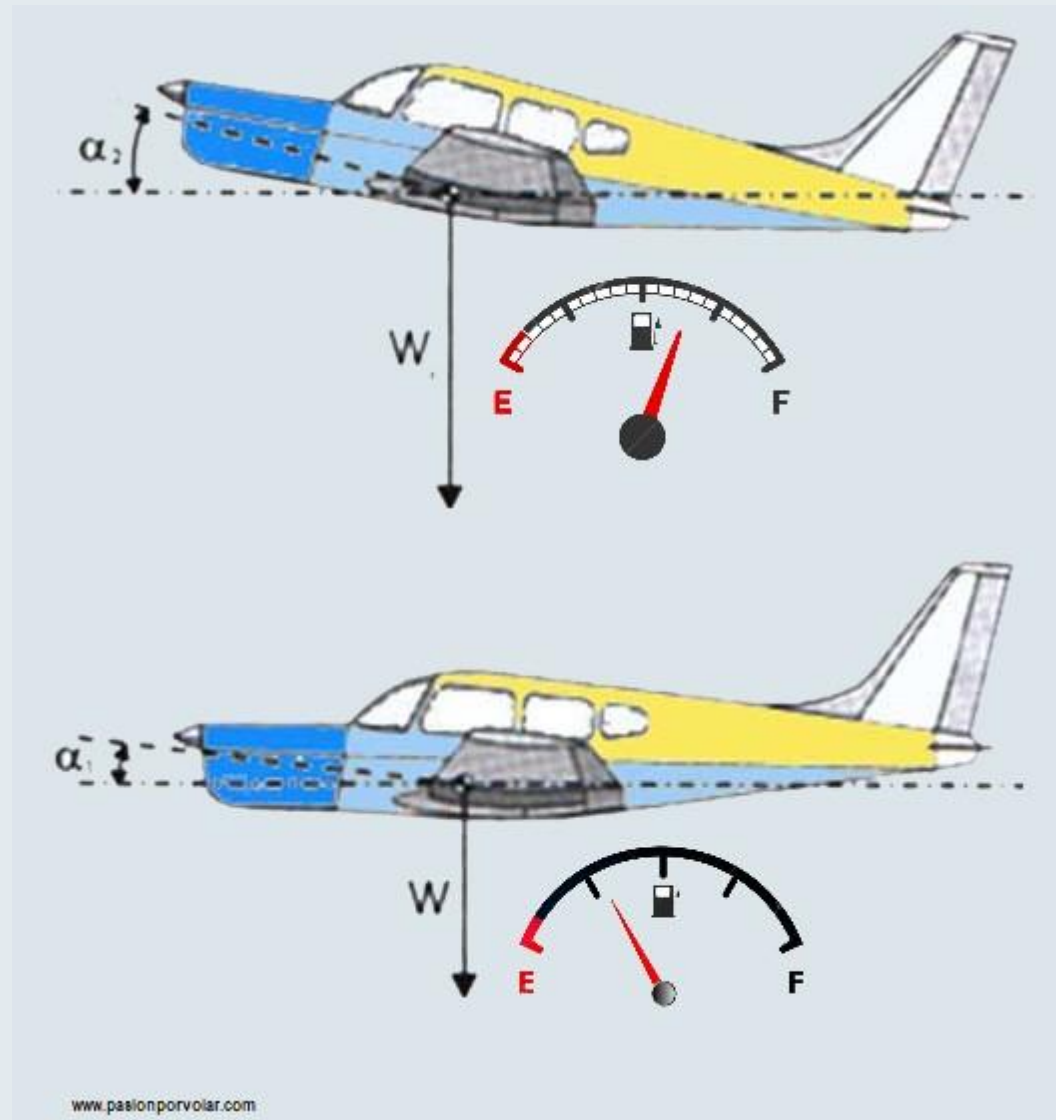
Dynamic of data: Maneuvers in flight

The relationship Turns - Load factor (G):



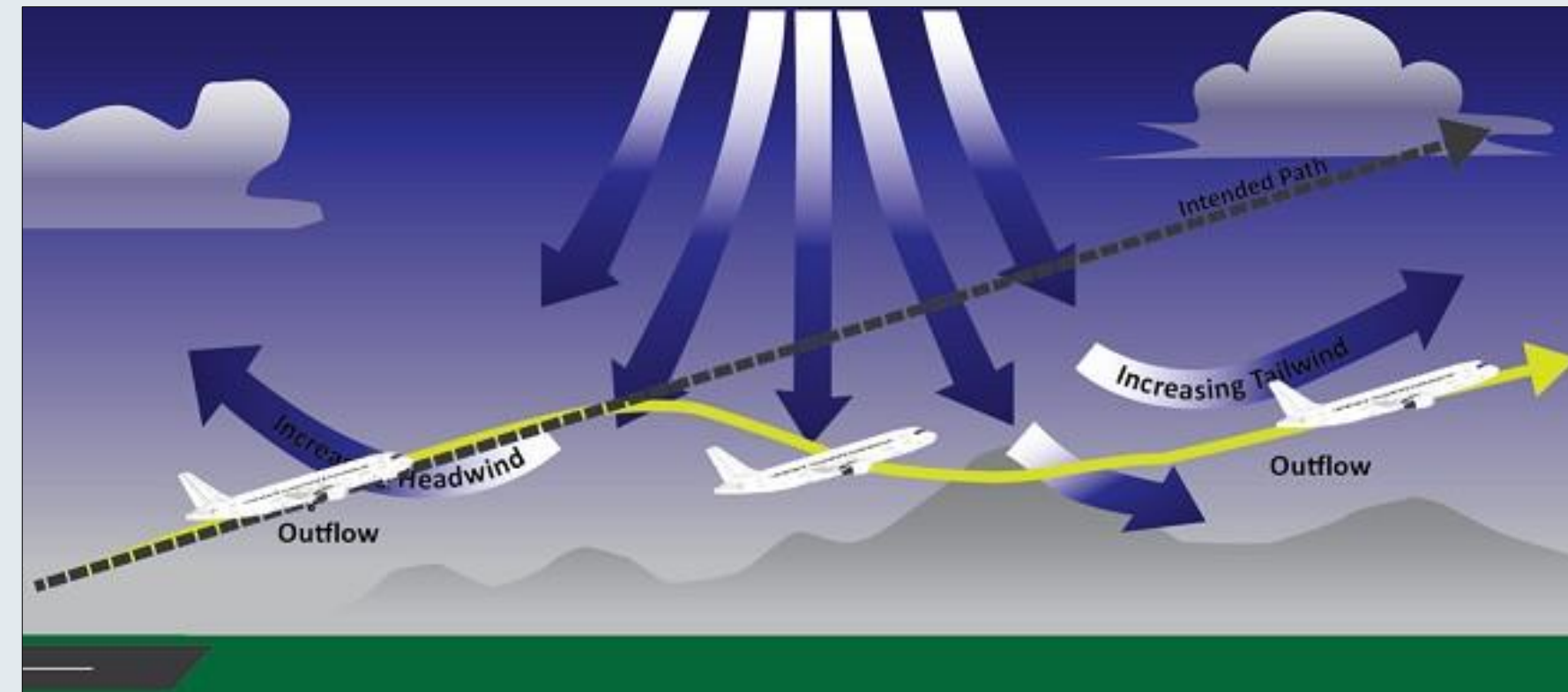
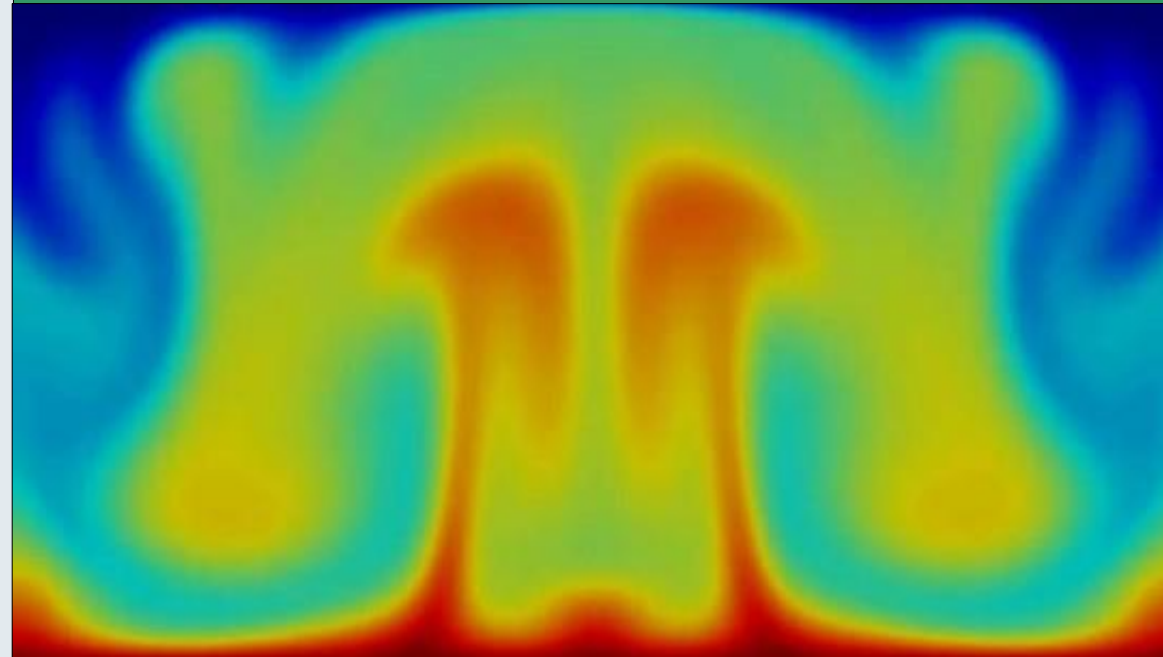
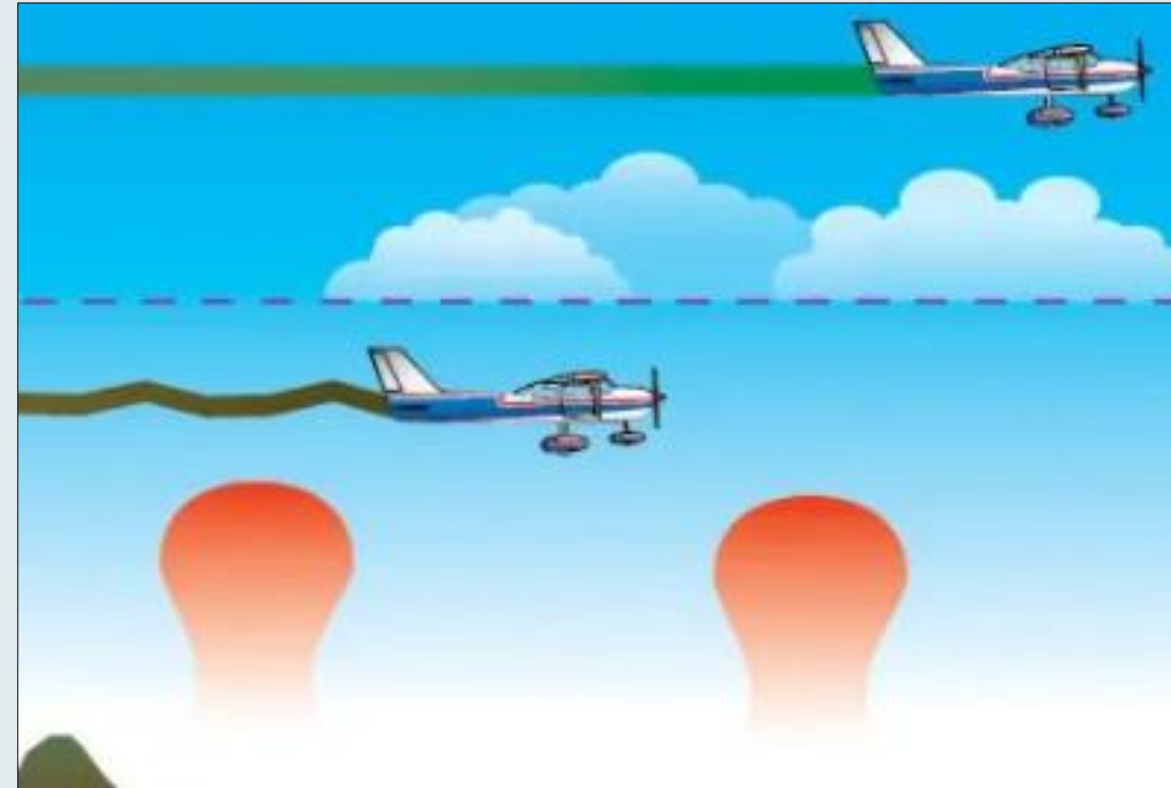
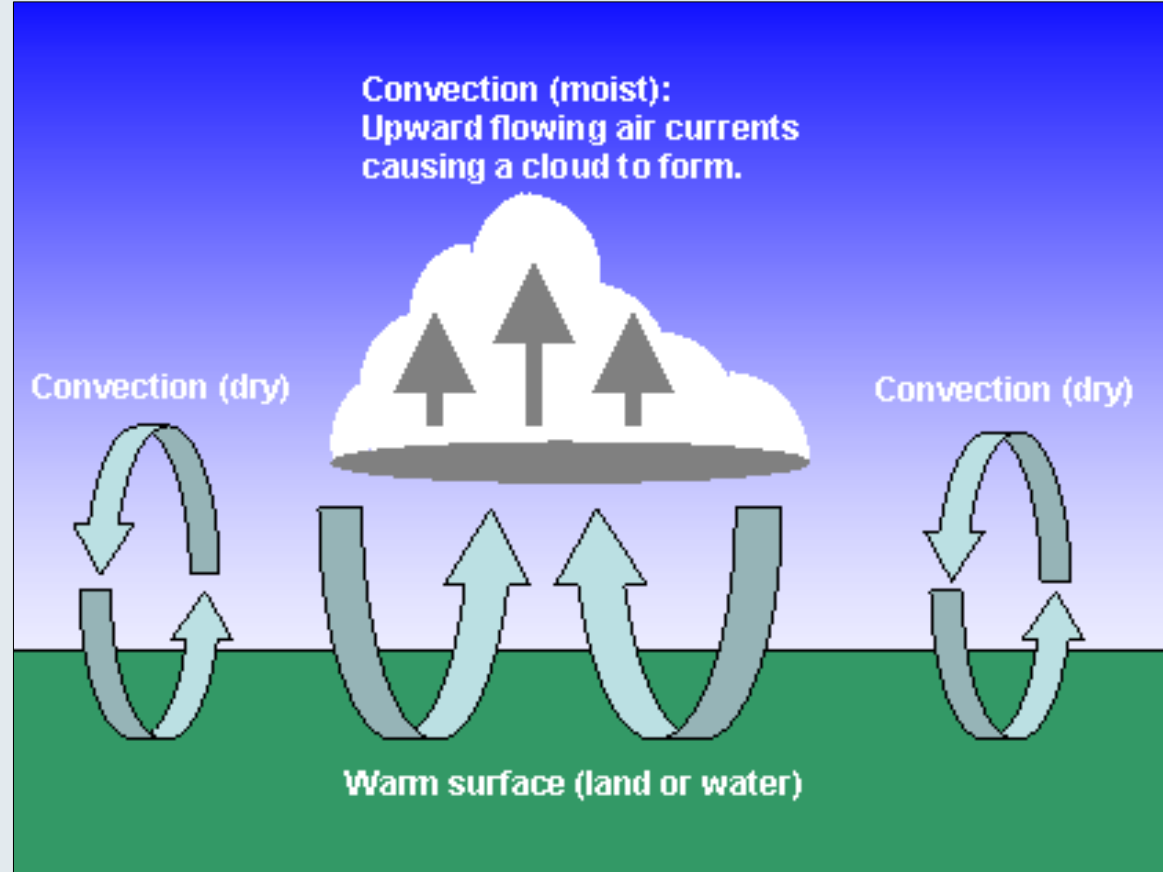
Dynamic of data: Maneuvers in flight

Changes of weight during flight :

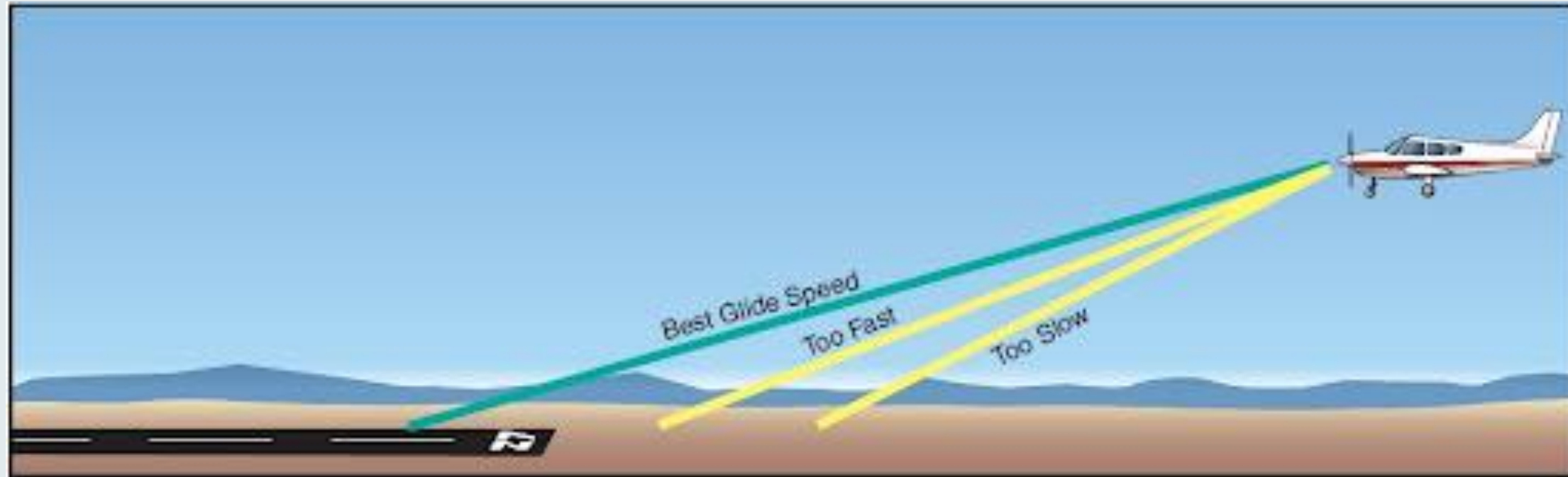


Dynamic of data: Maneuvers in flight

Weather conditions :



Dynamic of data: Descend and Landing

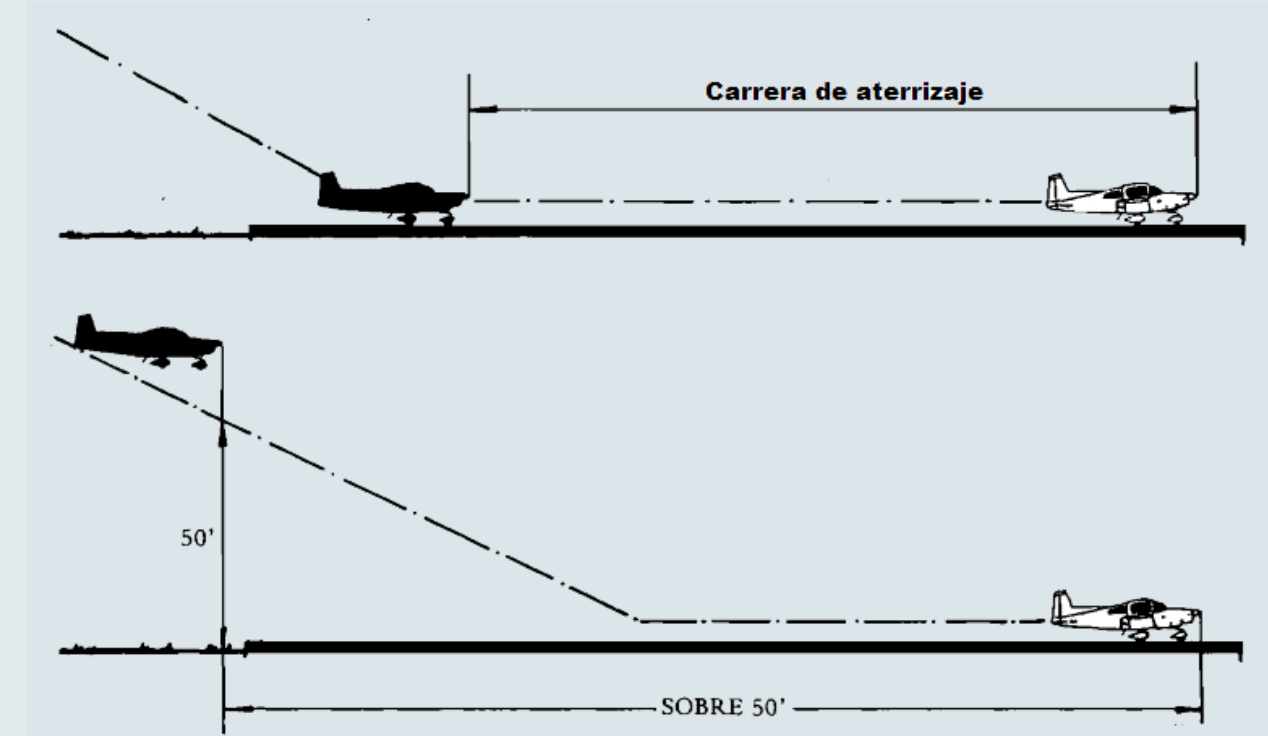
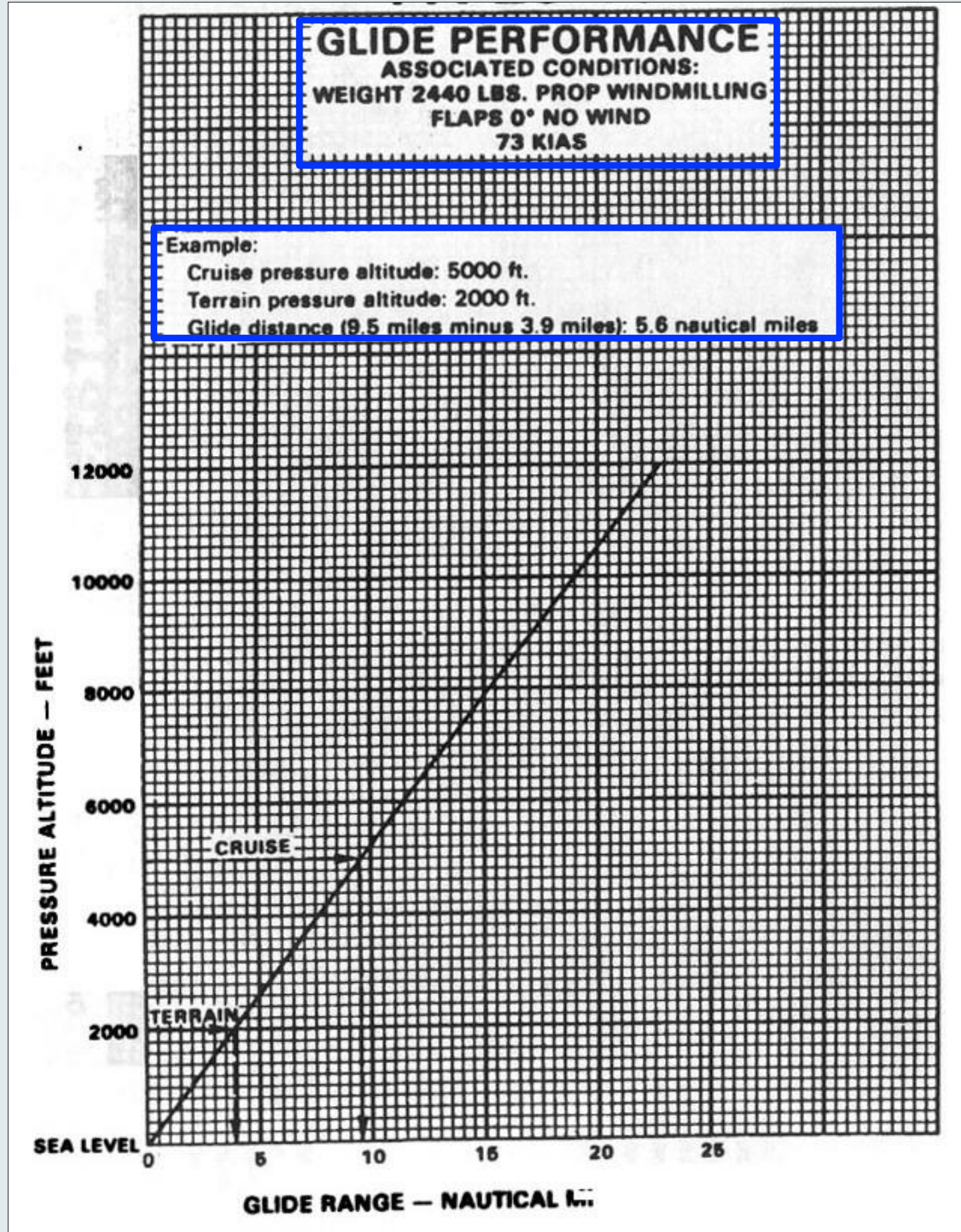


Some basic data to keep in mind account for a descend successful:

- Amount in height to lose.
- Speed of descend.
- Setting of power of the engine/s.
- Distance and time to the destination.
- Regime of descend.
- Configuration of the UAV.

Dynamic of data: Decline and Landing

Putting in practice :



LANDING DISTANCE

SHORT FIELD

CONDITIONS:
 Flaps 30°
 Power Off
 Maximum Braking
 Paved, Level, Dry Runway
 Zero Wind

NOTES:

1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
3. For operation on a dry, grass runway, increase distances by 45% of the "ground roll" figure.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
1670	54	S.L.	450	1160	465	1185	485	1215	500	1240	515	1265
		1000	465	1185	485	1215	500	1240	520	1270	535	1295
		2000	485	1215	500	1240	520	1270	535	1300	555	1330
		3000	500	1240	520	1275	540	1305	560	1335	575	1360
		4000	520	1275	540	1305	560	1335	580	1370	600	1400
		5000	540	1305	560	1335	580	1370	600	1400	620	1435
		6000	560	1340	580	1370	605	1410	625	1440	645	1475
		7000	585	1375	605	1410	625	1440	650	1480	670	1515
8000	605	1410	630	1450	650	1480	675	1520	695	1555		



THANKS

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