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GENERAL OPERATIONS, FLIGHT PLANNING AND PERFORMANCE

CHAPTER 18
PERFORMANCE CHARTS (P CHARTS)

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PERFORMANCE CHARTS (P CHARTS)

INTRODUCTION

Performance charts allow a pilot to predict the take-off, climb, cruise, and landing performance of the aircraft. These charts, provided by the manufacturer, are included in the AFM/POH. The information the manufacturer provides on these charts has been gathered from test flights conducted in a new aircraft, under normal operating conditions while using average piloting skills, and with the aircraft and engine in good working order. Engineers record the flight data and create performance charts based on the behaviour of the aircraft during the test flights.

By using these performance charts, a pilot can determine the runway length needed to take-off and land, the amount of fuel that will be used during flight, and the length of time it will take to arrive at the destination. It is important to remember that the data from the charts will not be accurate if the aircraft is not in good working order or when operating under adverse conditions. So take into consideration that it is necessary to compensate the performance numbers if the aircraft is not in good working order or piloting skills are below average. Each aircraft performs differently and therefore, has different performance numbers. Compute the performance of the aircraft prior to every flight, as every flight is different.

Every chart is based on certain conditions and contains notes on how to adapt the information for flight conditions. It is important to read every chart and understand how to use it. Read the accompanying instructions provided by the manufacturer. For an explanation on how to use the charts, refer to the example provided by the manufacturer for that specific chart.

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Gear Up
2600 RPM
Cowl Flaps Open
Standard Temperature

PRESS ALT	MP	PPH
S.L. TO 17,000	35	162
18,000	34	156
20,000	32	144
22,000	30	132
24,000	28	120

NOTES:
1. Add 16 pounds of fuel for engine start, taxi and takeoff allowance.
2. Increase time, fuel and distance by 10% for each 10 °C above standard temperature.
3. Distances shown are based on zero wind.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED POUNDS	DISTANCE NM
4000	S.L.	100	930	0	0	0
	4000	100	890	4	12	7
	8000	100	845	9		
	12,000	100	790			

The information manufacturers furnish is not standardised. Information may be contained in a table format, and other information may be contained in a graph format. Sometimes combined graphs incorporate two or more graphs into one chart to compensate for multiple conditions of flight. Combined graphs allow the pilot to predict aircraft performance for variations in density

altitude, weight, and winds all on one chart. Because of the vast amount of information that can be extracted from this type of chart, it is important to be very accurate in reading the chart. A small error in the beginning can lead to a large error at the end.

This learning object covers performance information for aircraft in general and discusses what information the charts contain and how to extract information from the charts by direct reading and interpolation methods. Every chart contains a wealth of information that should be used when flight planning. Examples of the table, graph, and combined graph formats for all aspects of flight will be discussed.

Remember, performance charts provide valuable information to the pilot. Take advantage of these charts. A pilot can predict the performance of the aircraft under most flying conditions, and this enables a better plan for every flight. Pilots should use the information to their advantage as it can only contribute to safety in flight.

INTERPOLATION

Not all of the information on the charts is easily extracted. Some charts require interpolation to find the information for specific flight conditions. Interpolating information means that by taking the known information, a pilot can compute intermediate information. However, pilots sometimes round-off values from charts to a more conservative figure.

Using values that reflect slightly more adverse conditions provides a reasonable estimate of performance information and gives a slight margin of safety. The following illustration is an example of interpolating information from a take-off distance chart.

TAKEOFF DISTANCE
MAXIMUM WEIGHT 2400 LBS

CONDITIONS:
Flaps 10°
Full Throttle Prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
2400	51	56	S. L.	795	1460	860	1570	925	1685	995	1810	1065	1945
			1000	875	1605	940	1725	1015	1860	1090	2000	1170	2155
			2000	960	1770	1035	1910	1115	2060	1200	2220	1290	2395
			3000	1055	1960	1140	2120	1230	2295	1325	2480	1425	2685
			4000	1165	2185	1260	2365	1355	2570	1465	2790	1575	3030
			5000	1285	2445	1390	2660	1500	2895	1620	3160	1745	3455
			6000	1425	2755	1540	3015	1665	3300	1800	3620	1940	3990
			7000	1580	3140	1710	3450	1850	3805	2000	4220	–	–
			8000	1755	3615	1905	4015	2060	4480	–	–	–	–

To find the takeoff distance for a pressure altitude of 2,500 feet at 20°C, average the ground roll for 2,000 feet and 3,000 feet.

$$\frac{1{,}115 + 1{,}230}{2} = 1{,}173 \text{ feet}$$

DENSITY ALTITUDE CHARTS

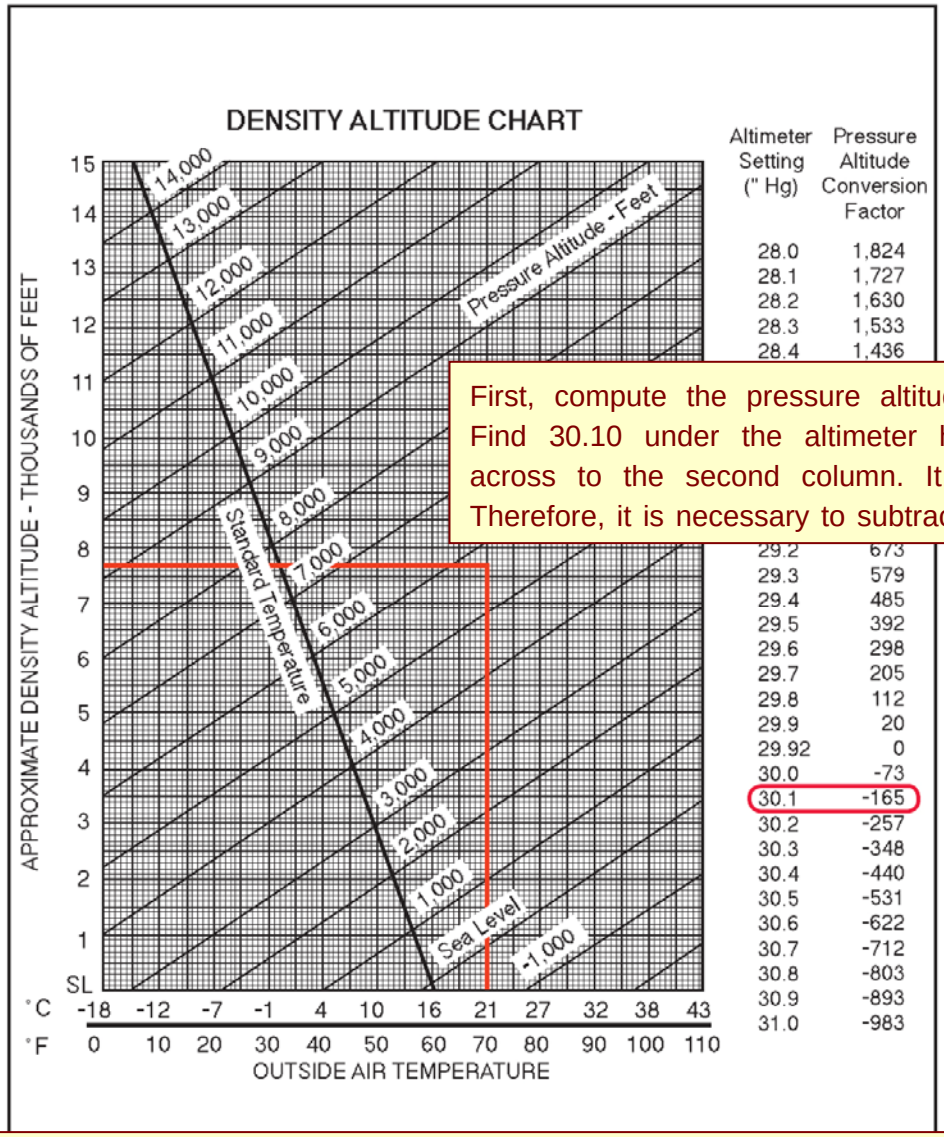
Use a density altitude chart to figure the density altitude at the departing airport. Using the chart and determine the density altitude based on the given information.

Example

Aerodrome Elevation = 5 883 feet

OAT = 21°C

Altimeter = 30.10 in. Hg



First, compute the pressure altitude conversion. Find 30.10 under the altimeter heading. Read across to the second column. It reads "-165." Therefore, it is necessary to subtract 165 from the

Next, locate the outside air temperature on the scale along the bottom of the graph. From 21°, draw a line up to the 5 718 feet pressure altitude line, which is about two-thirds of the way up between the 5 000 and 6 000-ft lines. Draw a line straight across to the far left side of the graph and read the approximate density altitude.
The approximate density altitude in thousands of feet is 7 700 feet.