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SECTION 5

PERFORMANCE

SECTION 5

PERFORMANCE

5.1 GENERAL

All of the required (FAA regulations) and complementary performance information applicable to this aircraft is provided by this section.

Performance information associated with those optional systems and equipment that require handbook supplements is provided by Section 9 (Supplements).

5.3 INTRODUCTION - PERFORMANCE AND FLIGHT PLANNING

The performance information presented in this section is based on measured Flight Test Data corrected to I.C.A.O. standard day conditions and analytically expanded for the various parameters of weight, altitude, temperature, etc.

The performance charts are unfactored and do not make any allowance for varying degrees of pilot proficiency or mechanical deterioration of the aircraft. This performance, however, can be duplicated by following the stated procedures in a properly maintained airplane.

Effects of conditions not considered on the charts must be evaluated by the pilot, such as the effect of soft or grass runway surface on takeoff and landing performance, or the effect of winds aloft on cruise and range performance. Endurance can be grossly affected by improper leaning procedures, and inflight fuel flow and quantity checks are recommended.

REMEMBER! To get chart performance, follow the chart procedures.

The information provided by paragraph 5.5 (Flight Planning Example) outlines a detailed flight plan using the performance charts in this section. Each chart includes its own example to show how it is used.

WARNING

Performance information derived by extrapolation beyond the limits shown on the charts should not be used for flight planning purposes.

5.5 FLIGHT PLANNING EXAMPLE

(a) Aircraft Loading

The first step in planning a flight is to calculate the airplane weight and center of gravity by utilizing the information provided by Section 6 (Weight and Balance) of this handbook.

The basic empty weight for the airplane as licensed at the factory has been entered in Figure 6-5. If any alterations to the airplane have been made affecting weight and balance, reference to the aircraft logbook and Weight and Balance Record (Figure 6-7) should be made to determine the current basic empty weight of the airplane.

Make use of the Weight and Balance Loading Form (Figure 6-11) and the C.G. Range and Weight graph (Figure 6-15) to determine the total weight of the airplane and the center of gravity position.

After proper utilization of the information provided, the following weights apply to the flight planning example.

The landing weight cannot be determined until the weight of the fuel to be used has been established [refer to item (g)(1)].

(1)	Basic Empty Weight	1391 lbs.
(2)	Occupants (4 x 170 lbs.)	680 lbs.
(3)	Baggage and Cargo	50 lbs.
(4)	Fuel (6 lb/gal x 30)	180 lbs.
(5)	Takeoff Weight	2316 lbs.
(6)	Landing Weight (a)(5) minus (g)(1), (2316 lbs. minus 136.8 lbs.	2179.2 lbs.

The takeoff weight is below the maximum of 2440 lbs., and the weight and balance calculations have determined that the C.G. position is within the approved limits.

(b) Takeoff and Landing

Now that the aircraft loading has been determined, all aspects of the takeoff and landing must be considered.

All of the existing conditions at the departure and destination airport must be acquired, evaluated and maintained throughout the flight.

Apply the departure airport conditions and takeoff weight to the appropriate Takeoff Performance graph (Figures 5-7 and 5-9 or 5-11 and 5-13) to determine the length of runway necessary for the takeoff and/or the barrier distance.

The landing distance calculations are performed in the same manner using the existing conditions at the destination airport and, when established, the landing weight.

The conditions and calculations for the example flight are listed below. The takeoff and landing distances required for the example flight have fallen well below the available runway lengths.

	Departure Airport	Destination Airport
(1) Pressure Altitude	1500 ft.	2500 ft.
(2) Temperature	27°C	24°C
(3) Wind Component	15 KTS (Headwind)	0 KTS
(4) Runway Length Available	4800 ft.	7600 ft.
(5) Runway Required	2100 ft.*	1135 ft.**

NOTE

The remainder of the performance charts used in this flight planning example assume a no wind condition. The effect of winds aloft must be considered by the pilot when computing climb, cruise and descent performance.

*reference Figure 5-9
**reference Figure 5-35

(c) Climb

The next step in the flight plan is to determine the necessary climb segment components.

The desired cruise pressure altitude and corresponding cruise outside air temperature values are the first variables to be considered in determining the climb components from the Fuel, Time and Distance to Climb graph (Figure 5-19). After the fuel, time and distance for the cruise pressure altitude and outside air temperature values have been established, apply the existing conditions at the departure field to graph (Figure 5-19). Now, subtract the values obtained from the graph for the field of departure conditions from those for the cruise pressure altitude.

The remaining values are the true fuel, time and distance components for the climb segment of the flight plan corrected for field pressure altitude and temperature.

The following values were determined from the above instructions in the flight planning example.

(1) Cruise Pressure Altitude	5000 ft.
(2) Cruise OAT	16°C
(3) Time to Climb (12.0 min. minus 3.0 min.)	9.0 min.*
(4) Distance to Climb (16.0 miles minus 4.0 miles)	12.0 miles*
(5) Fuel to Climb (3 gal. minus 1.0 gal.)	2.0 gal.*

(d) Descent

The descent data will be determined prior to the cruise data to provide the descent distance for establishing the total cruise distance.

Utilizing the cruise pressure altitude and OAT, determine the basic fuel, time and distance for descent (Figure 5-31). These figures must be adjusted for the field pressure altitude and temperature at the destination airport. To find the necessary adjustment values, use the existing pressure altitude and temperature conditions at the destination airport as variables to find the fuel, time and distance

*reference Figure 5-19

values from the graph (Figure 5-31). Now, subtract the values obtained from the field conditions from the values obtained from the cruise conditions to find the true fuel, time and distance values needed for the flight plan.

The values obtained by proper utilization of the graphs for the descent segment of the example are shown below.

(1) Time to Descend
(7.5 min. minus 4.5 min.) 3.0 min.*

(2) Distance to Descend
(13.5 miles minus 8.0 miles) 5.5 miles*

(3) Fuel to Descend
(1.0 gal. minus .5 gal.) .5 gal.*

(e) Cruise

Using the total distance to be traveled during the flight, subtract the previously calculated distance to climb and distance to descend to establish the total cruise distance. Refer to the appropriate Avco Lycoming Operator's Manual when selecting the cruise power setting. The established pressure altitude and temperature values and the selected cruise power should now be utilized to determine the true airspeed from the Cruise Performance graph (Figure 5-21 or 5-23).

Calculate the cruise fuel consumption for the cruise power setting from the information provided by the Avco Lycoming Operator's Manual.

The cruise time is found by dividing the cruise distance by the cruise speed and the cruise fuel is found by multiplying the cruise fuel consumption by the cruise time.

The cruise calculations established for the cruise segment of the flight planning example are as follows:

(1) Total Distance 300 miles

(2) Cruise Distance
(e)(1) minus (c)(4) minus (d)(2),
(300 minus 12 miles minus 5.5 miles) 282.5 miles

*reference Figure 5-31

(3)	Cruise Power Best Economy Mixture	75% rated power (2625 RPM)
(4)	Cruise Speed	118 KTS TAS*
(5)	Cruise Fuel Consumption	8.5 GPH
(6)	Cruise Time (e)(2) divided by (e)(4), (283.5 miles divided by 118 KTS)	2.39 hrs.
(7)	Cruise Fuel (e)(5) multiplied by (e)(6), (8.5 GPH mulitiplied by 2.40 hrs.)	20.3 gal.

(f) Total Flight Time

The total flight time is determined by adding the time to climb, the time to descend and the cruise time. Remember! The time values taken from the climb and descent graphs are in minutes and must be converted to hours before adding them to the cruise time.

The following flight time is required for our flight planning example.

(1)	Total Flight Time (c)(3) plus (d)(1) plus (e)(6), (.15 hrs. plus .05 hrs. plus 2.39 hrs.)	2.59 hrs.

(g) Total Fuel Required

Determine the total fuel required by adding the fuel to climb, the fuel to descend and the cruise fuel. When the total fuel (in gallons) is determined, multiply this value by 6 lb/gal. to determine the total fuel weight used for the flight.

The total fuel calculations for the example flight plan are shown below.

(1)	Total Fuel Required (c)(5) plus (d)(3) plus (e)(7), (2.0 gal. plus .5 gal. plus 20.3 gal.)	22.8 gal.
	(22.8 gal. multiplied by 6 lb/gal.)	136.8 lbs.

*reference Figure 5-23

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5.7 PERFORMANCE GRAPHS

LIST OF FIGURES

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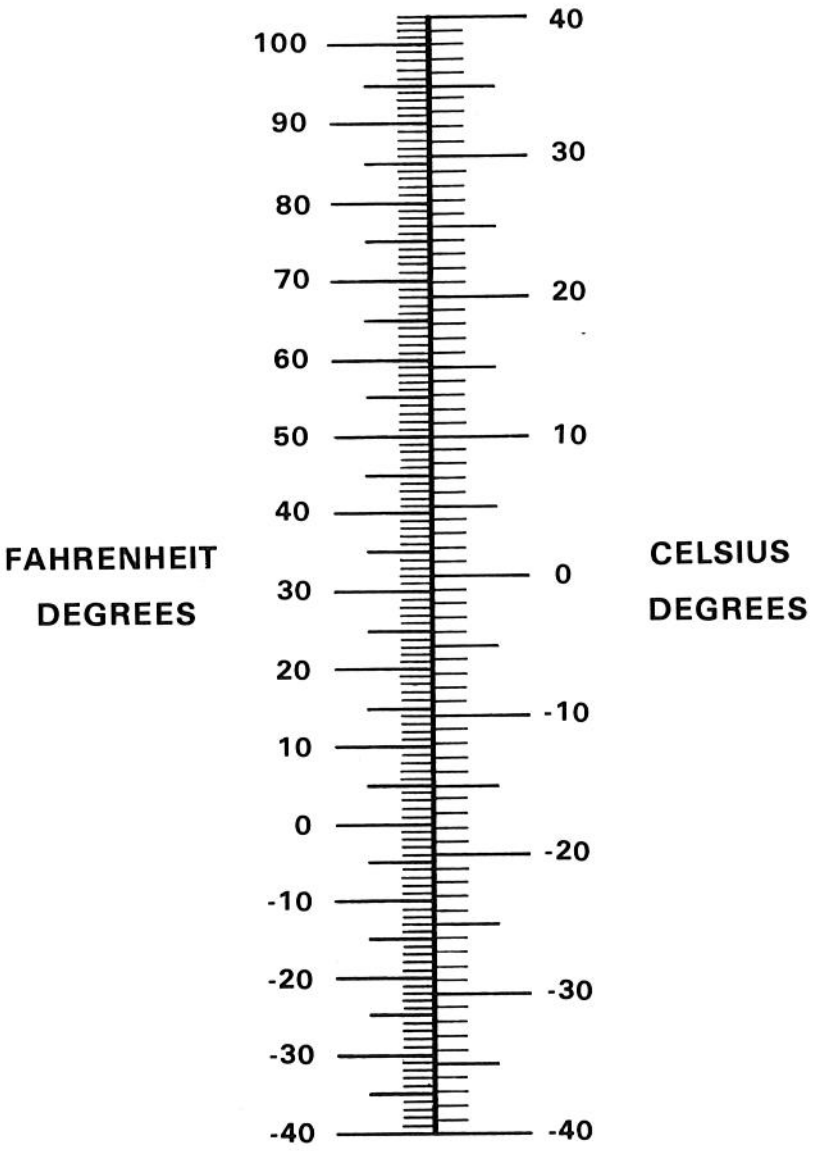
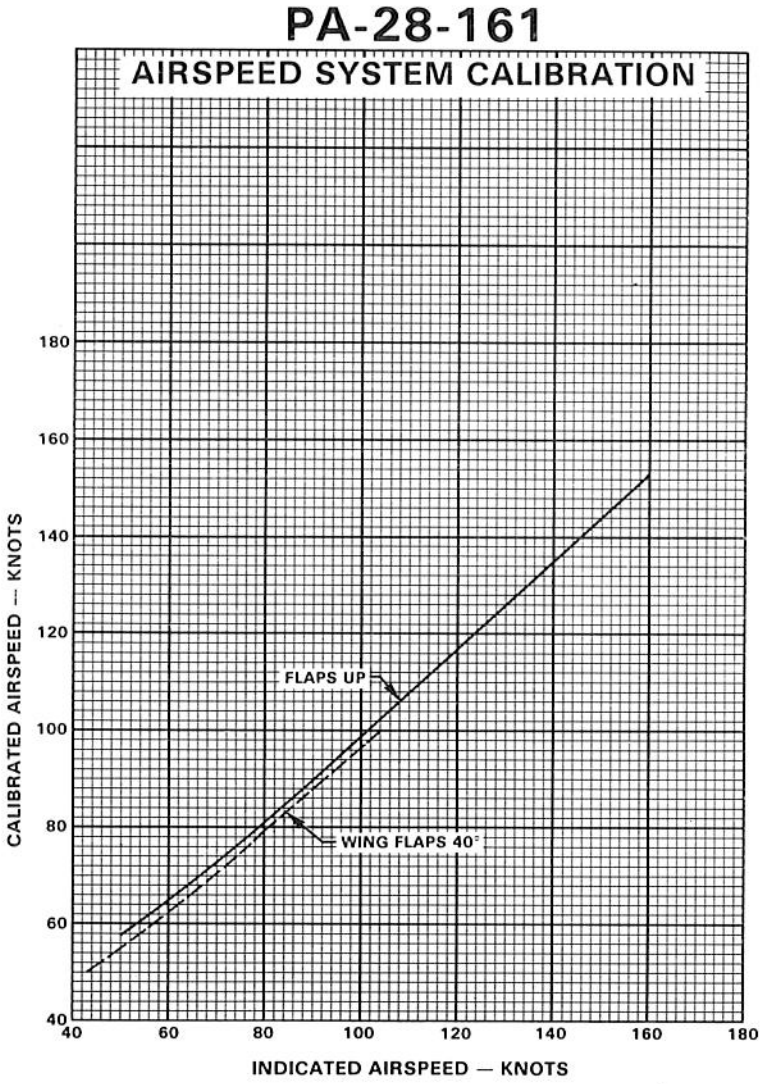
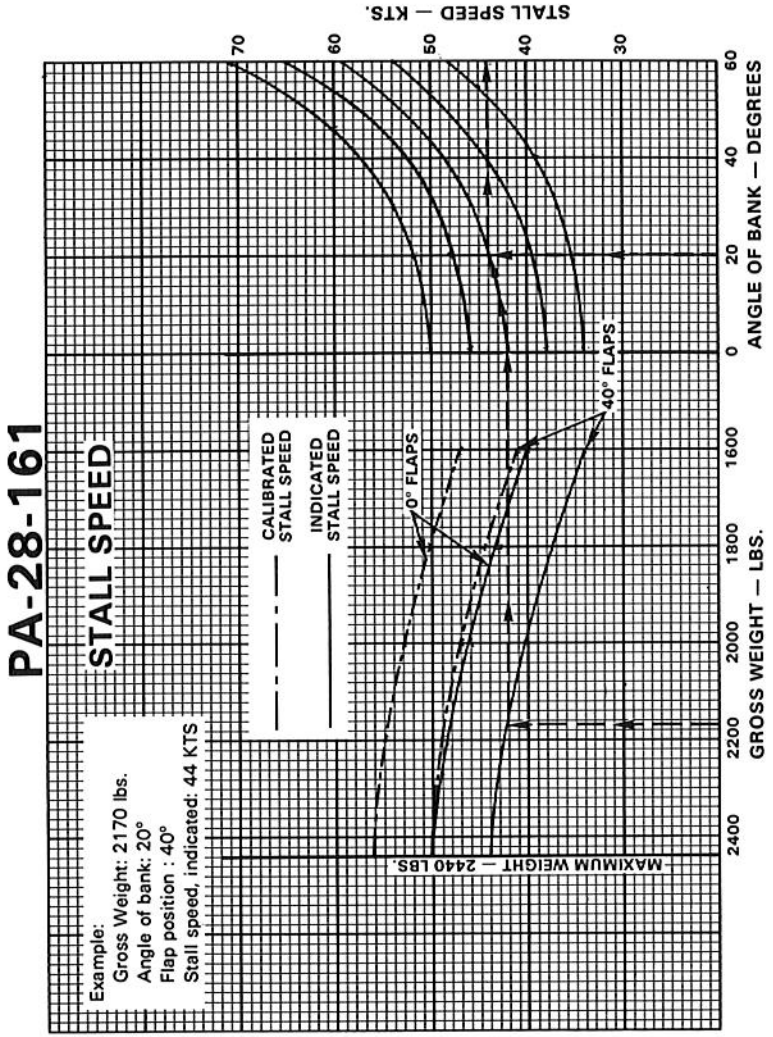


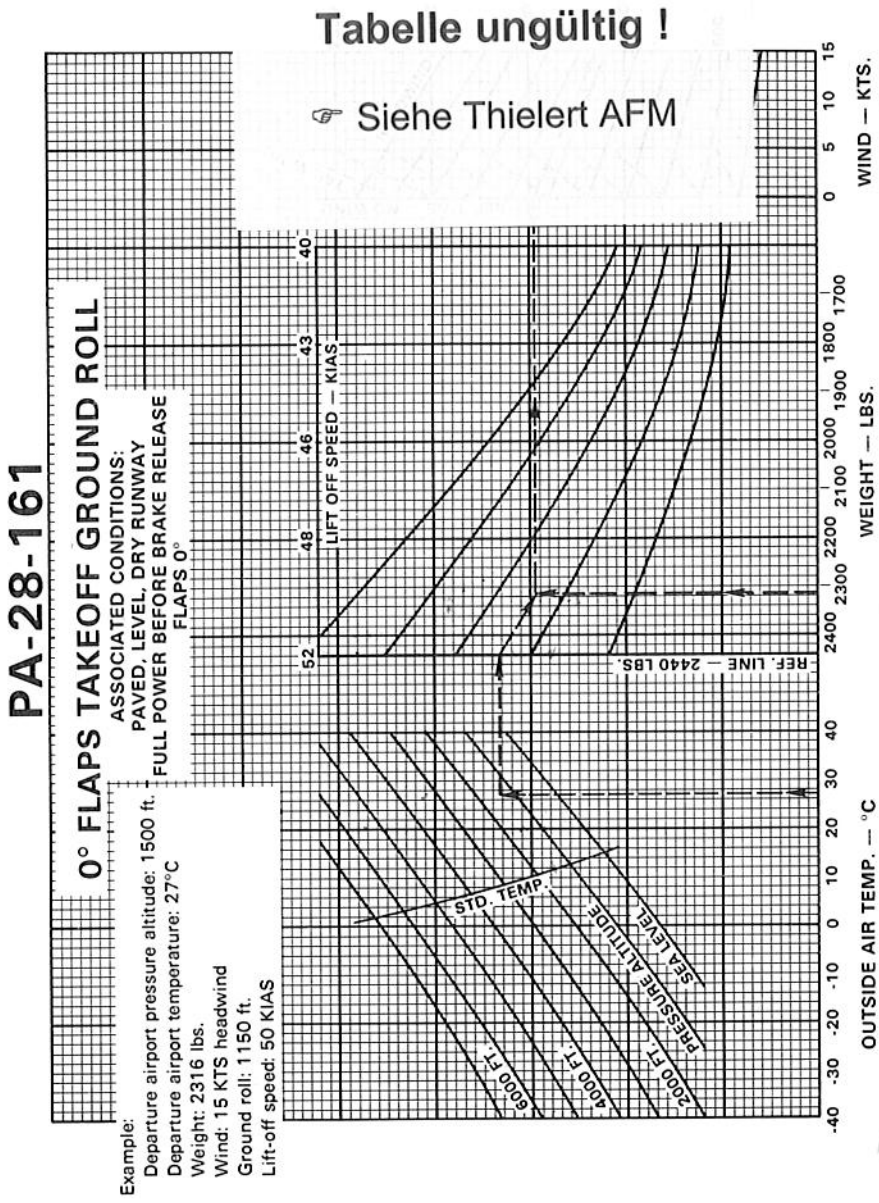
TEMPERATURE CONVERSION
Figure 5-1



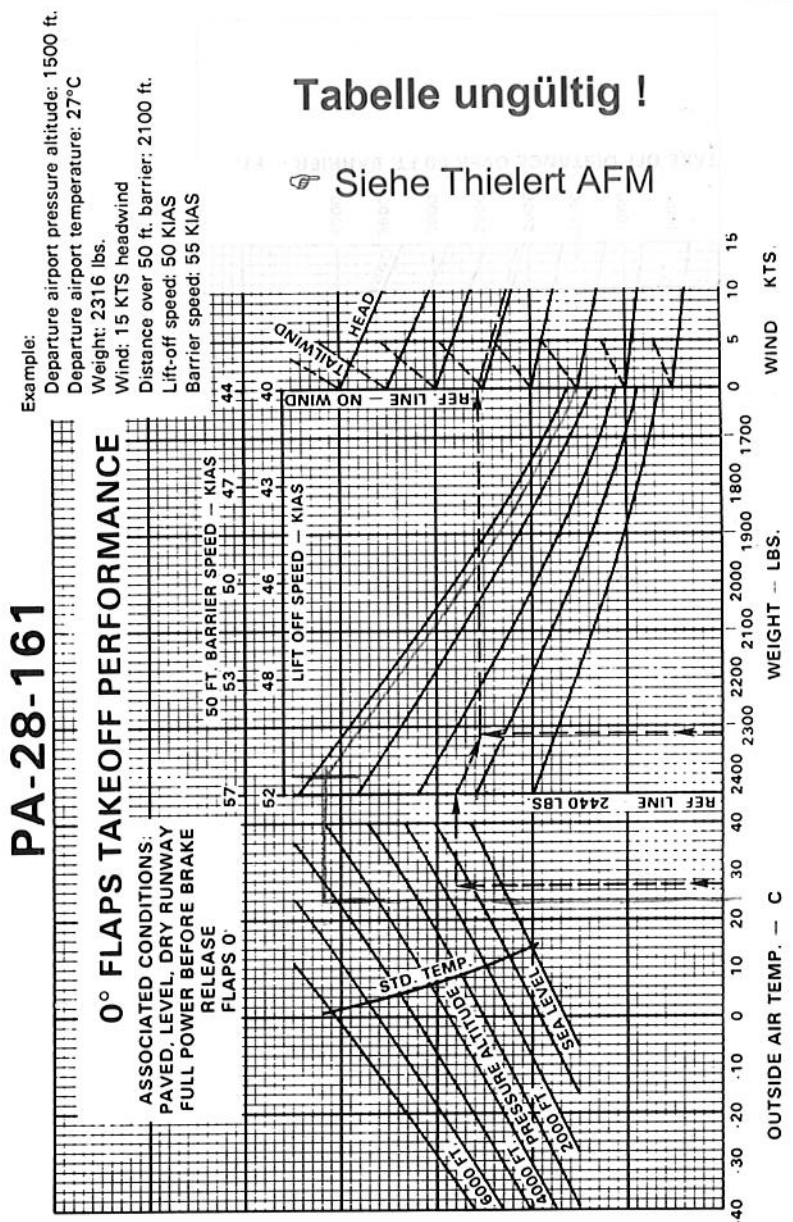
AIRSPEED SYSTEM CALIBRATION
Figure 5-3



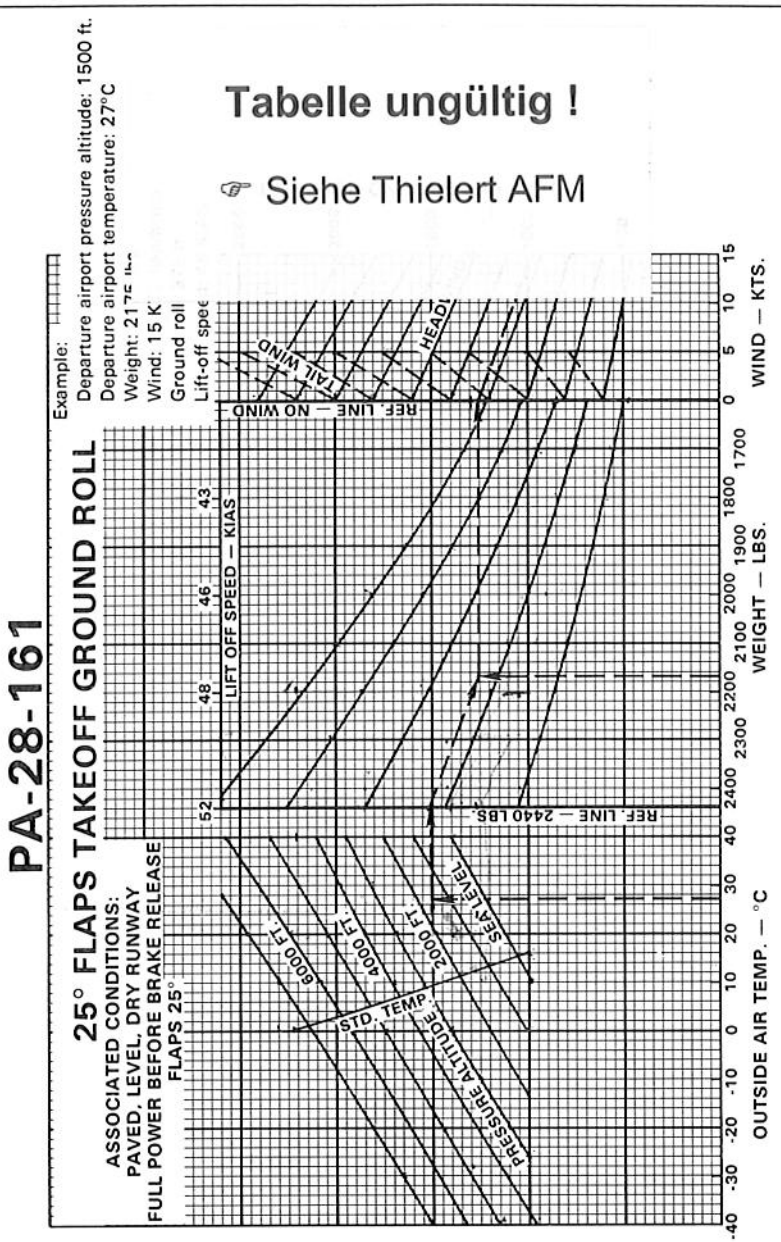
STALL SPEED
Figure 5-5



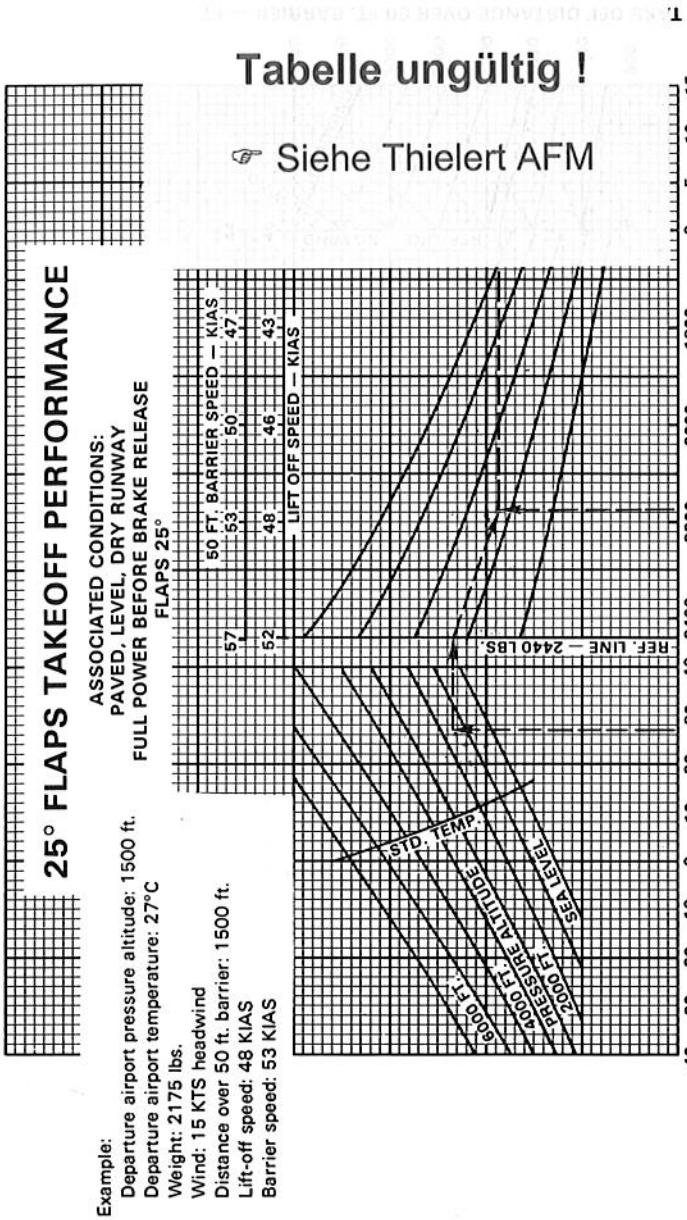
0° FLAPS TAKEOFF GROUND ROLL
Figure 5-7



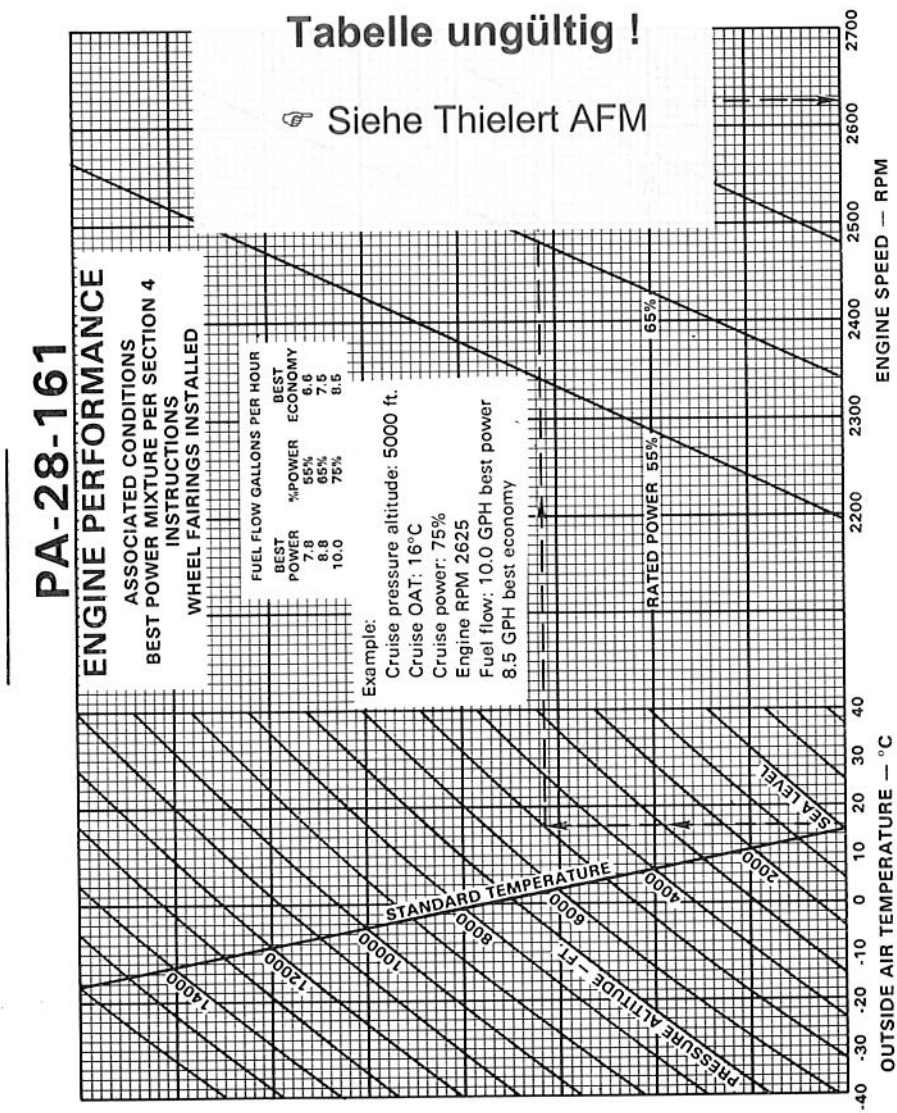
0° FLAPS TAKEOFF PERFORMANCE
Figure 5-9



25° FLAPS TAKEOFF GROUND ROLL
Figure 5-11



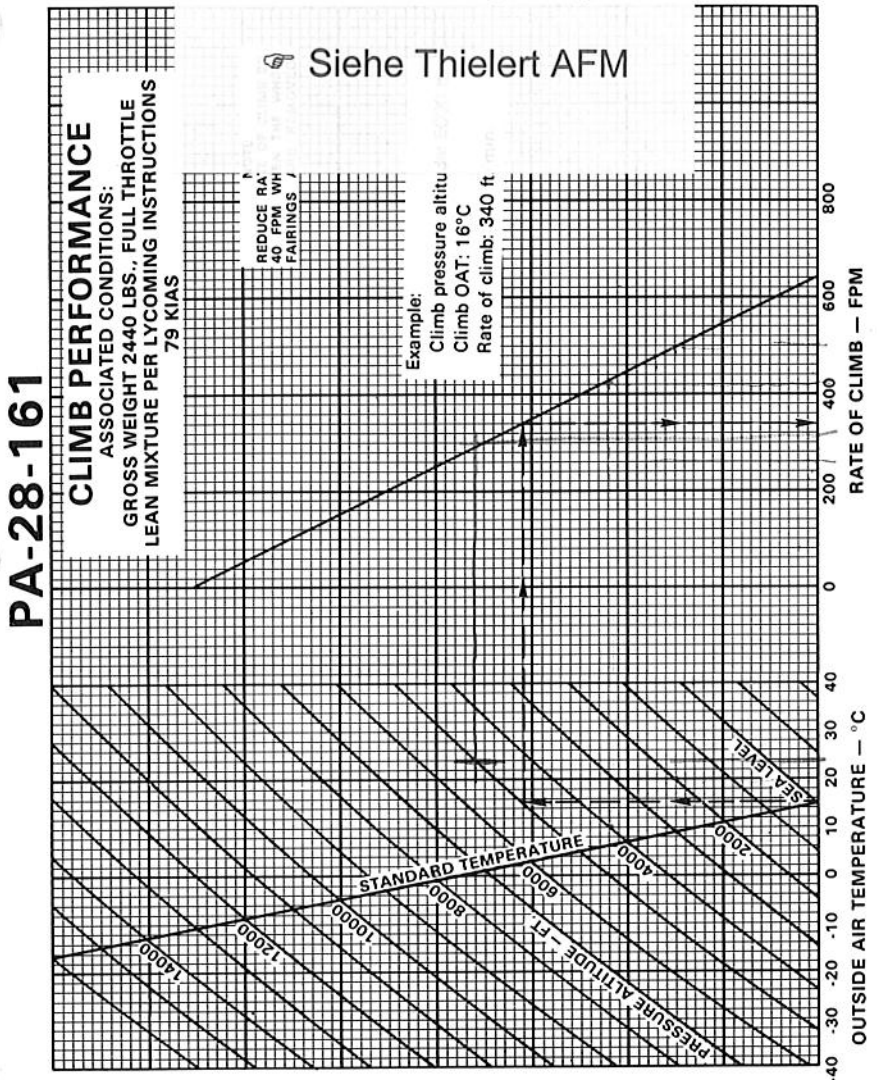
25° FLAPS TAKEOFF PERFORMANCE
Figure 5-13



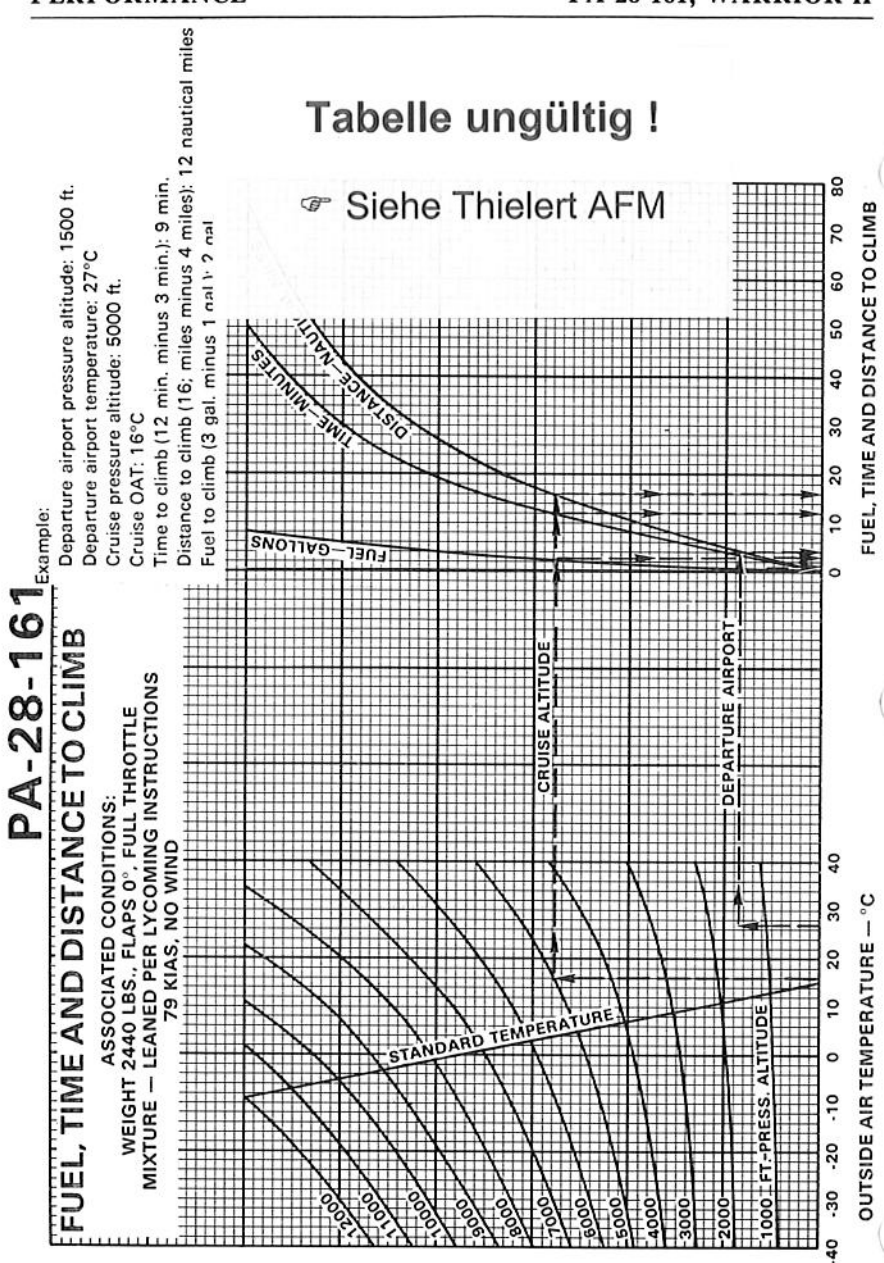
ENGINE PERFORMANCE
Figure 5-15

Tabelle ungültig !

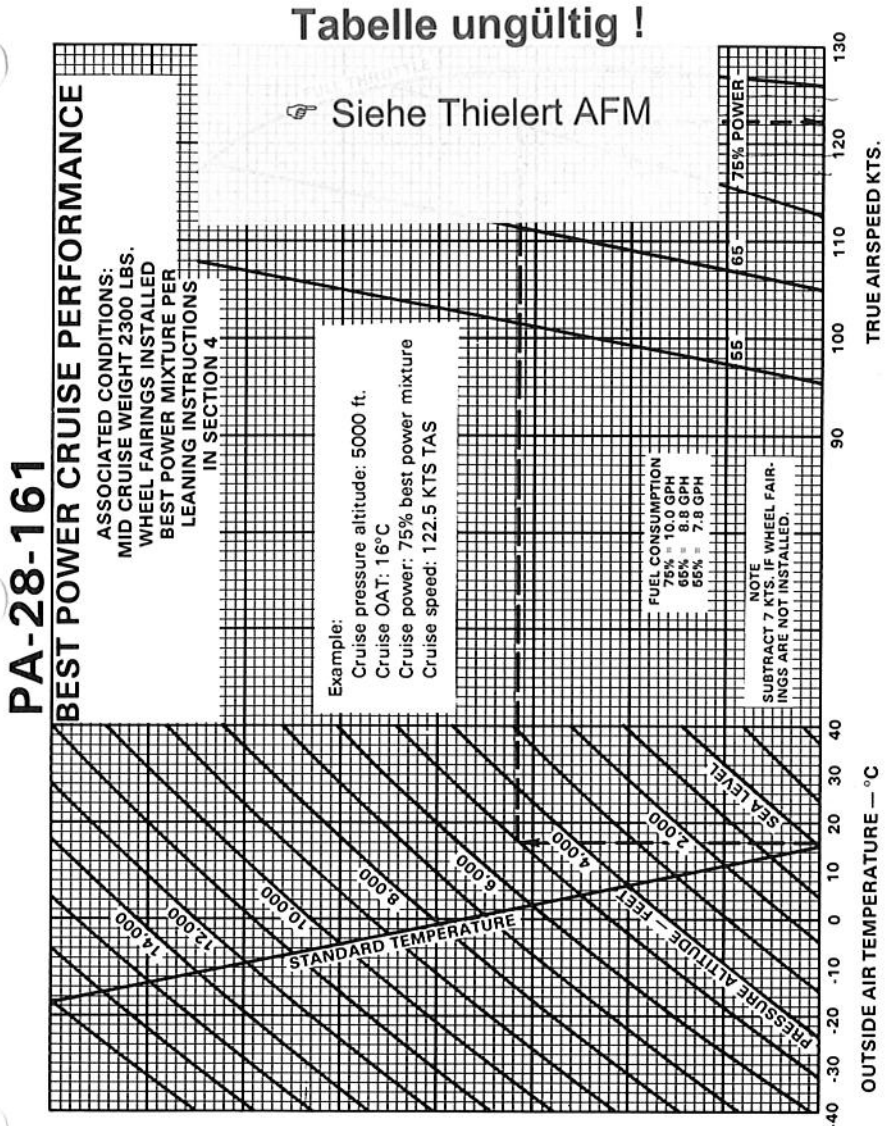
Siehe Thielert AFM



CLIMB PERFORMANCE
Figure 5-17



FUEL, TIME AND DISTANCE TO CLIMB
Figure 5-19



BEST POWER CRUISE PERFORMANCE
Figure 5-21

Tabelle ungültig !

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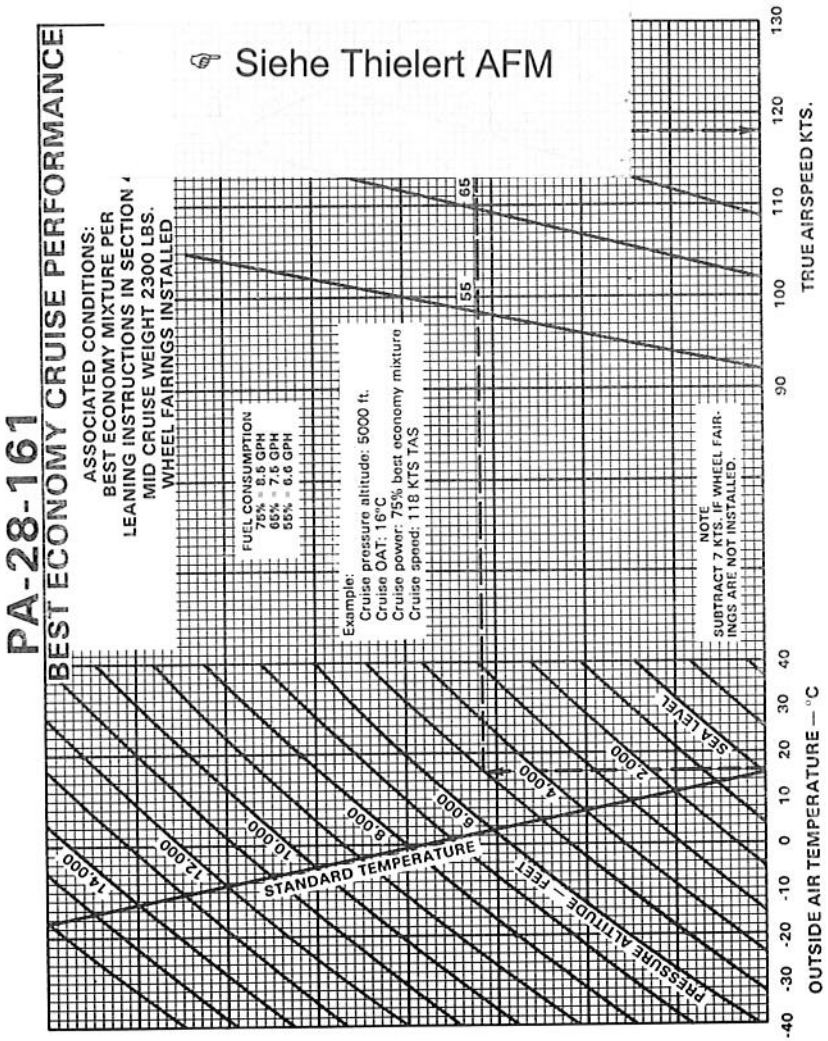
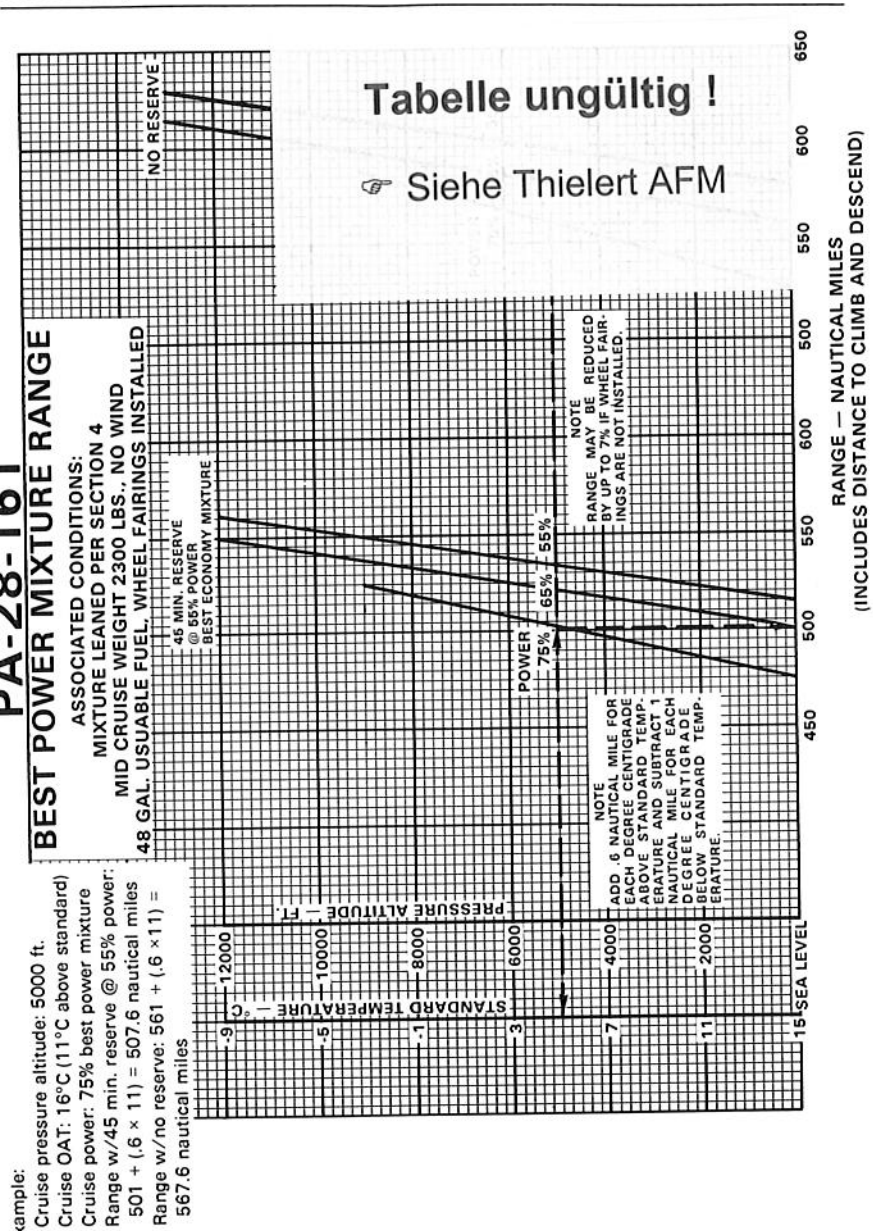
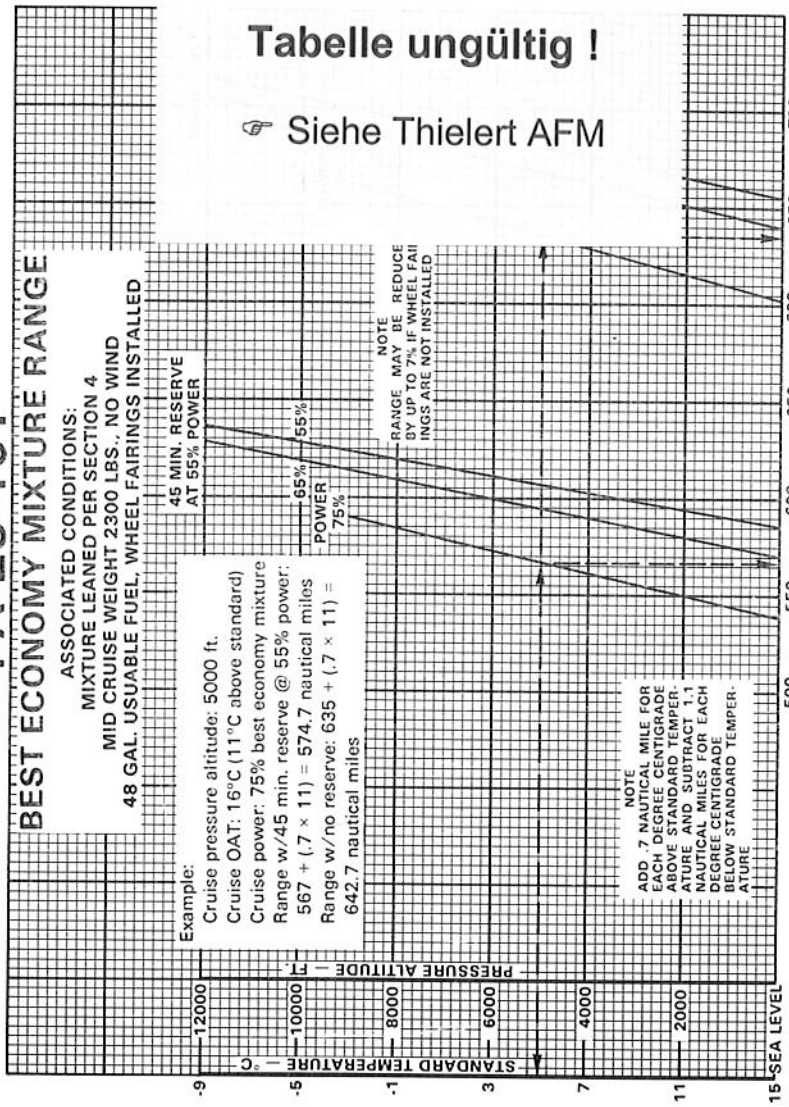


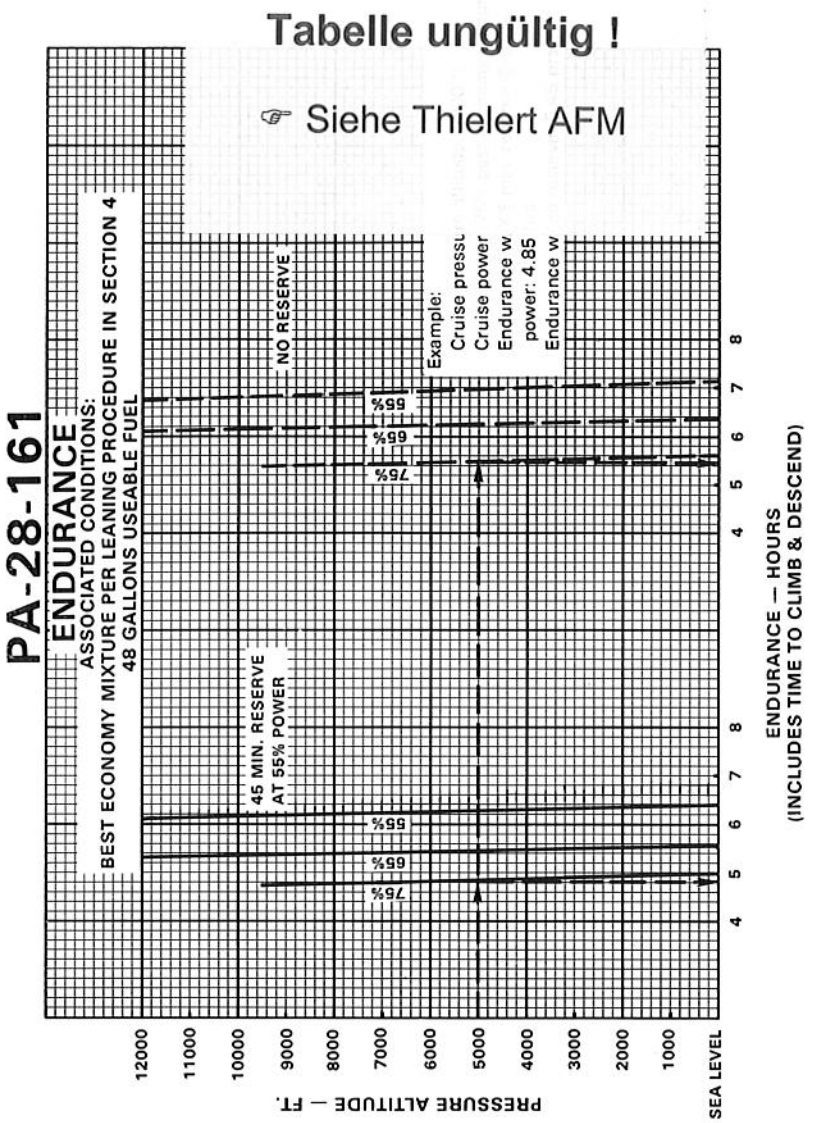
BEST ECONOMY CRUISE PERFORMANCE
Figure 5-23



BEST POWER MIXTURE RANGE
Figure 5-25



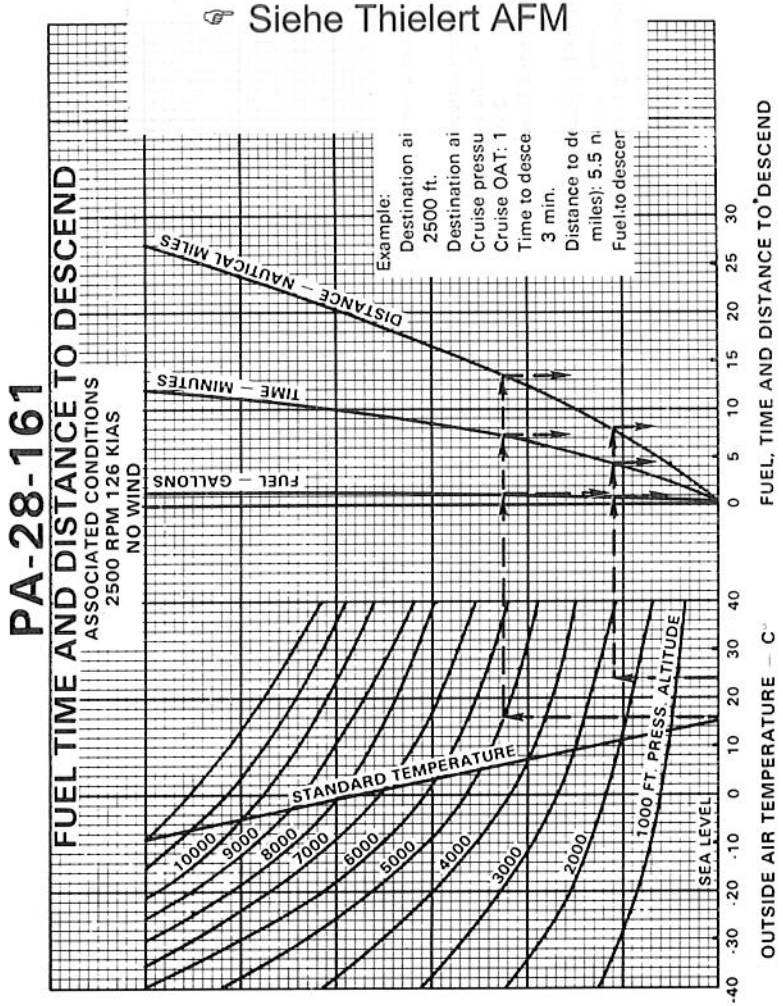
BEST ECONOMY MIXTURE RANGE
Figure 5-27



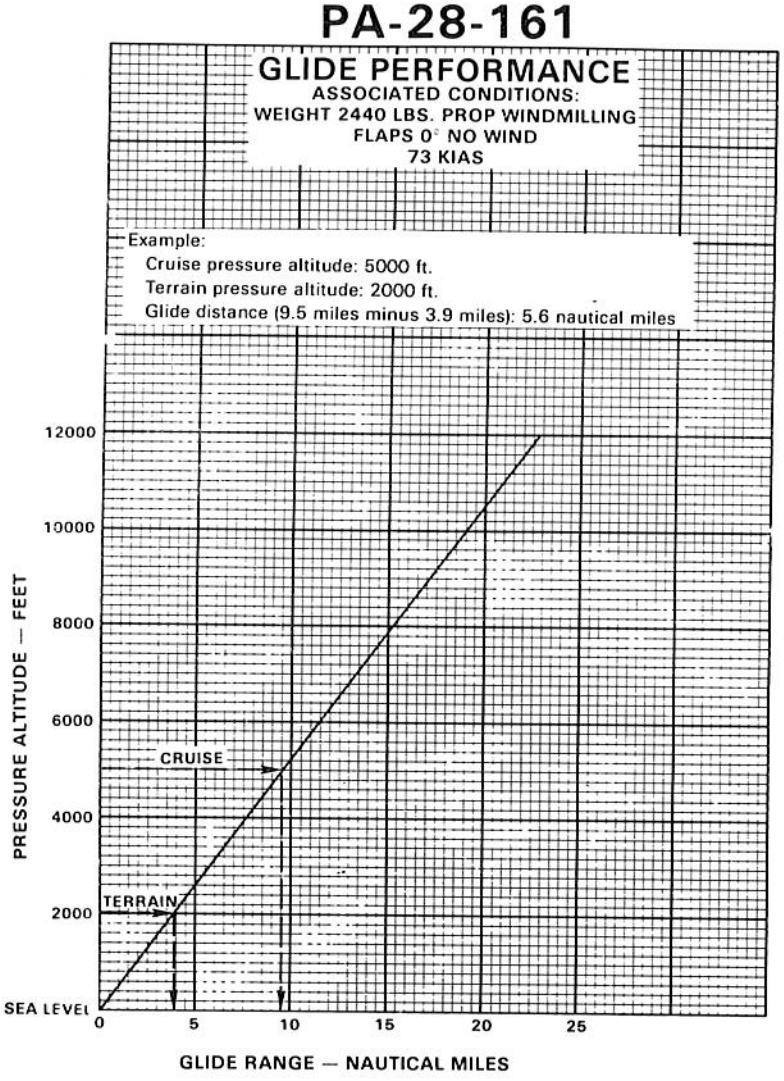
ENDURANCE
Figure 5-29

Tabelle ungültig !

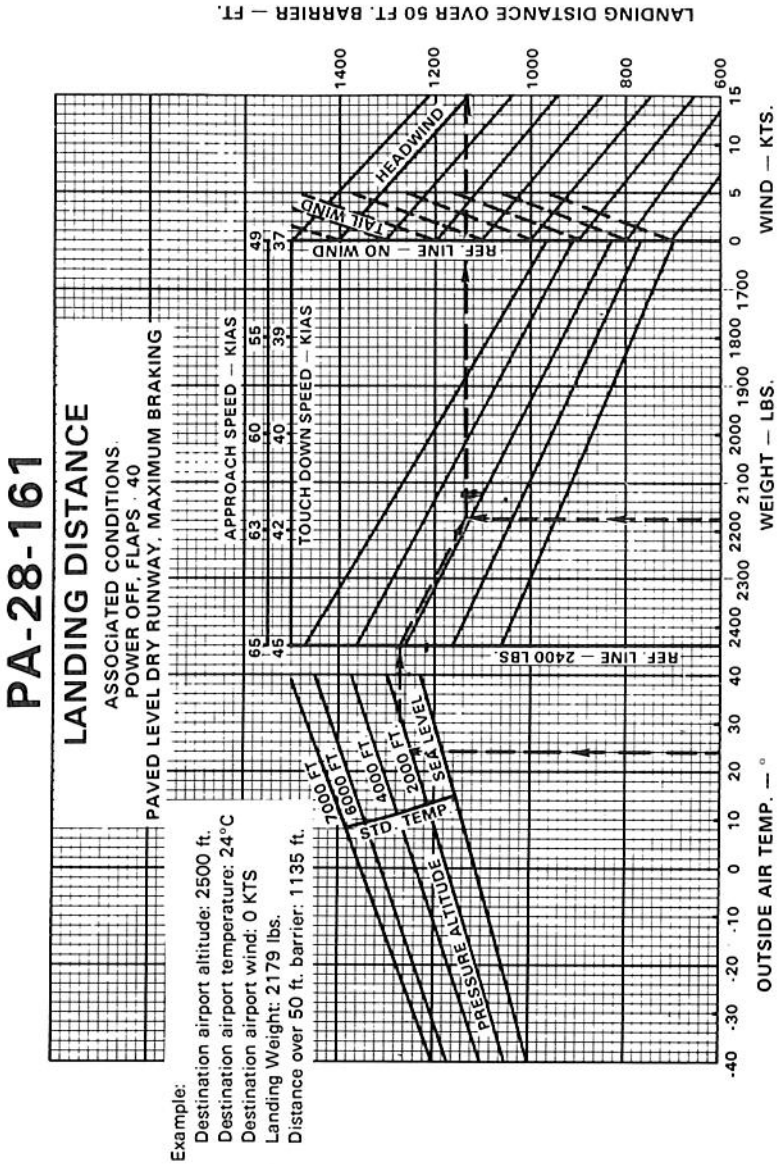
☞ Siehe Thielert AFM



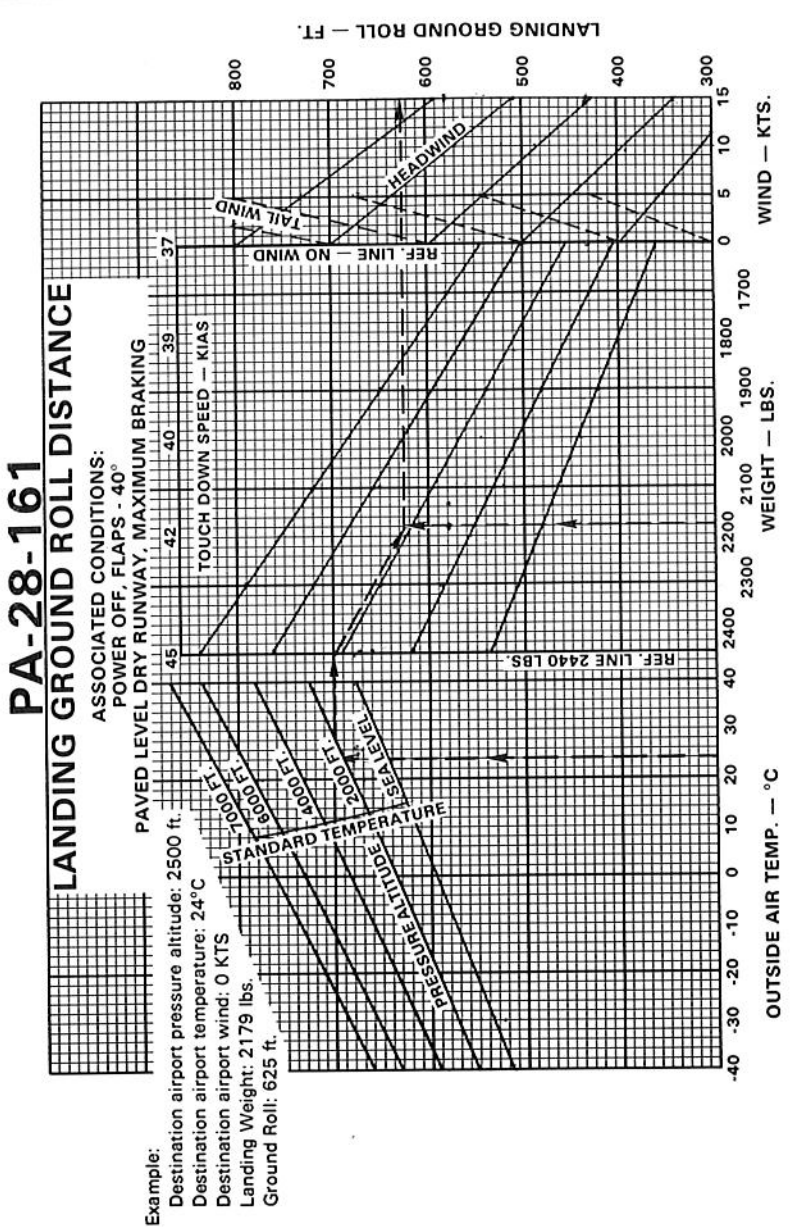
FUEL, TIME AND DISTANCE TO DESCEND
Figure 5-31



GLIDE PERFORMANCE
Figure 5-33



LANDING DISTANCE
Figure 5-35



LANDING GROUND ROLL DISTANCE
Figure 5-37