CHAPTER 3
PREFLIGHT ACTION

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GENERAL

Preflight action, weight and balance and performance information for the BSU Cessna Skyhawk C172R is contained within this chapter. The information contained within these chapters *must be combined with the information provided in the Performance section of the appropriate aircraft POH* to calculate the necessary performance data for normal operations. It also provides specific performance factors to be considered during abnormal and emergency operations.

Included are representative examples, demonstrating proper use of the charts and / or tables. Both chapters are arranged in the order most typically used by the flight crew (i.e.: preflight, planning, execution, etc.).

Performance information associated with optional systems and equipment is provided in Section 9 (Supplements) of the Pilot's Operating Handbook / Airplane Flight Manual.

The performance information presented in this chapter is based on measured flight test data corrected for I.C.A.O. standard day conditions and analytically expanded for the various parameters of weight, altitude, temperature, etc. Performance charts in the aircraft POH are not factored and do not make any allowance for varying degrees of pilot proficiency or mechanical deterioration of the aircraft.

Preflight Action Philosophy

The meaning of Preflight Action encompasses obtaining all of the information required for a particular flight. It includes, but is not limited to, obtaining a proper flight/weather briefing, calculating weight and balance and performance, complying with all regulations, including but not limited to FAR 91.103, determining aircraft airworthiness and inoperative equipment, if any. A systematic approach to preflight action will produce the best results in the shortest possible time, allowing for safe, efficient and timely aircraft departure and operation.

Effects of conditions not considered on the charts must be evaluated by the flight crew, such as the effects of a 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 in flight fuel flow and quantity checks are recommended.

The information included in this chapter provides the procedures necessary to complete a Bridgewater State University Takeoff Data Card and Flight Plan Form. The performance charts in the aircraft POH include examples to show how to calculate relevant flight information.

NOTE

The following side-by-side TOLD card and the Flight/ Weather Briefing Form are provided for the convenience of the pilot and should be printed as necessary.

Cessna 172R Skyhawk Takeoff & Landing Data Card

Student: ______________ **Instructor:** ____________ **Date:** __________

Aircraft N #_________	Departure Information	Arrival Information
Winds		
Visibility		
Ceilings (AGL)		
Temperature/Dew Point		
Local Altimeter		
Active Runway(s)		
Density Altitude		
Pressure Altitude		
Runway Length Available		
Headwind Component		
Crosswind Component		
Tailwind Component		

Aircraft Performance Data

Runway: PAVED DIRT GRASS Condition: DRY WET SNOW ICE

Takeoff Distance (Ground Roll)_________ Distance over 50' obstacle : __________

Max. aborted takeoff distance __________
(takeoff ground roll + landing ground roll + 30% safety margin)

Initial Climb Rate: ______________ FPM

Landing Distance (Ground Roll)_________ Distance over 50' obstacle : __________

V_{SO}__________ V_A __________ Approach/Landing Speed(s)_______

V_{S1} __________ V_{FE} __________ Best Glide (Flaps Up) ___________

V_X __________ V_{NO}__________

V_Y __________ V_{NE} __________

Cessna 172R Takeoff and Landing Data (TOLD) Card

Weight and Balance Data

	WEIGHT	ARM	MOMENT
Basic Empty Weight	______	______	______
Pilot and Passenger	______	______	______
Rear Passengers (or back seat baggage)	______	______	______
Baggage Area 1 (max 120 lbs)	______	______	______
Baggage Area 2 (max 50 lbs, max combined for areas 1 and 2 120 lbs)	______	______	______
Zero Fuel Weight	______	______	______
Fuel	______	______	______
Ramp Weight	______	______	______
Start/Taxi/Run-up (-7 lbs fuel)	______	______	______
Takeoff Weight 2450 Norm./2100 Util.	______	______	______
Load Adjustments: Front Passenger	______	______	______
Rear Passenger	______	______	______
Baggage	______	______	______
Fuel	______	______	______
Adjusted Takeoff Wt	______	______	______
Fuel Burn	______	______	______
Landing Weight	______	______	______

Minimum Fuel Load __________ **Gallons**

FLIGHT / WEATHER BRIEFING

Flight / Weather briefing philosophy

While often referred to as the “Weather” briefing for the sake of brevity, the correct way to think about the official briefing is as a Flight briefing. While weather is and will remain the main component of the briefing, there are many other flight safety related items contained in a standard briefing that are unrelated to the weather. Regulations require pilots to be familiar with ALL available information. The only official source of such information is obtaining an official Flight / Weather briefing.

Even in situation where there is absolutely no adverse weather of any kind (clear, unlimited visibility and ceiling and calm winds) obtaining an official briefing will help the pilot to avoid, for example, situations like the following:

1) Flying through a TFR without following proper procedures
2) Diverting to a closed airport
3) Running into a new unmarked obstruction
4) Attempting to use a navaid that is removed for maintenance
5) Landing on a closed runway
6) Executing an obsolete air traffic procedure
7) Any other unpleasant situation that might be known to the briefer, but not the pilot

Even the most current (unexpired) charts and publications are potentially outdated the minute they come out. One must obtain the most current information, and the only way to ensure it is to obtain an official Flight and Weather briefing from a certified source.

Official vs. unofficial sources

While there are many sources of Flight and Weather information, most of these sources are, while extremely useful, yet unofficial. That means the DELIVERY method cannot be guaranteed, and there is no official RECORD created that a briefing has been received. While one may obtain information from these sources in ADDITION to the official sources, one may never replace the official sources with unofficial sources, no matter how similar the information presented seems to be.

The two methods of obtaining an official Flight and Weather Briefing are verbally (in person or over the phone, and in the air) or electronically, via DUATS or a similar certified system. There is an official record created that a briefing has been obtained. A useful way to think about it is that, in aviation, if there is no proper record for something, then it did not take place.

To obtain an official briefing over the phone, any individual with a Pilot certificate (including student pilots) can dial 1-800-WX-BRIEF to contact a Flight Service specialist. In the air, pilots can contact Flight Service Stations over the radio for essentially the same information, should an updated briefing become necessary.

To obtain an official weather briefing electronically via DUATS, one can use the Internet or other certified electronic methods. The two distinct FAA certified DUATS vendors can be found at www.duat.com and www.duats.com

One advantage of obtaining a briefing over the phone or in person with a live briefing specialist is that you get the briefer's judgment, in addition to the flight and weather information.

One advantage of obtaining a briefing electronically is that it is a fast method of delivery that puts all the information in front of the pilot, who can then spend as much time as necessary looking at the information.

Detailed discussion of Flight /Weather briefing procedures is beyond the scope of this manual. Consult the appropriate official publications. You may also refer to the following FAA link: http://www.hf.faa.gov/weatherdecisionguide/preflight.aspx

WEIGHT and BALANCE

This section outlines weight and balance procedures for the BSU Cessna 172. This section is provided only to SUPPLEMENT the official Weight and Balance section in the Cessna C172R POH / AFM, and is not intended to replace it. Refer to the POH / AFM for additional information.

Flight Crew Procedures

Cessna 172 Takeoff and Landing Data (TOLD) Card
The Takeoff and Landing Data (TOLD) Card is utilized by flight crewmembers for computing the Zero Fuel Weight, Takeoff Weight, Adjusted Takeoff Weight, and Landing Weight for the aircraft before flight. Instructions for the completion of a TOLD are provided in this chapter.

Basic Empty Weight
From the dispatched aircraft clipboard "can" enter the basic empty weight (BEW), arm, and moment of the aircraft in the TOLD card. That information can also be obtained from the aircraft list, available in the briefing room, should the aircraft "can" not be presently available.

NOTE
If any discrepancies are found between data contained on the "can" and in the Pilot's Operating Handbook (POH) / Approved Airplane Flight Manual (AFM) in the aircraft, refer to the W/B data included in the AFM. Report any discrepancies between data sources to BSU Dispatch.

Pilot & Passengers
Enter the weight of the pilot and front seat passenger. To determine moment, use the following method:

1. Using the Bridgewater State University FSM and the aircraft's POH / AFM, multiply the total weight of the pilot and the passenger by the arm location.
2. The arm locations are found in Weight and Balance, Section 6, Loading Arrangements, of the POH / AFM.

Rear Passengers / Baggage in back seat
Enter the weight of any rear passengers or baggage to be carried in the rear seat, if appropriate. Use the same methods as described in "Pilot & Passengers" to determine the moment.

Baggage in baggage areas
Enter weight of any baggage to be stowed in rear baggage areas. Use the methods previously described to determine the moment.

Maximum Combined Weight in Baggage Compartments...120 lbs

Zero Fuel Weight
Determine Zero Fuel Weight and Balance by adding the weights and moments from Basic Empty Weight, Pilot & Passenger, Rear Passengers, and Baggage. Divide moment by weight to determine arm. Determine that the Zero Fuel Weight center-of-gravity is within limits.

Fuel
Enter the weight of all useable fuel on board the aircraft, converting from gallons to pounds. Multiply the weight of the fuel by the arm, using previously described method, to determine the moment.

Ramp Weight
Determine Ramp Weight and Balance by adding the weights and moments from Zero Fuel Weight and Fuel. Divide moment by weight to determine arm. Compare the Ramp Weight to the Maximum Ramp Weight found in the Bridgewater State University FSM or the aircraft Pilot's Operating Handbook / Airplane Flight Manual.

Start / Taxi / Run-up
From the Bridgewater State University FSM or aircraft Pilot's Operating Handbook / Airplane Flight Manual, determine the weight and moment of fuel used during engine start, taxi, and run-up.

NOTE			
Fuel Burn for Engine Start, Taxi & Run-up	**Weight - 7 Lbs.**	**Arm 48.0"**	**Moment -336 In-Lbs**

Takeoff Weight
Subtract the weight and moment from Start / Taxi / Run-up from Ramp Weight. Divide moment by weight to determine arm. Determine whether the aircraft is within Maximum Takeoff Weight and center-of-gravity limits by using the Center-of-Gravity Limits Graph in the aircraft Pilot's Operating Handbook / Airplane Flight Manual.

Load Adjustments

Passenger
Enter the amount of passenger(s) weight / moment, if appropriate, to be adjusted. Put a plus sign for adding weight / moment or a minus sign to subtract the weight / moment (example +150 or –150 lbs.). Enter a "0" or put a line through the space for no adjustment.

Baggage
Enter the amount of baggage weight / moment, if appropriate, to be adjusted. Put a plus sign for adding weight / moment or a minus sign to subtract the weight / moment (example +30 or –30 lbs.). Enter a "0" or put a line through the space for no adjustment.

Fuel
Enter the amount of fuel weight / moment, if appropriate, to be adjusted. Put a plus sign for adding weight / moment or a minus sign to subtract the weight / moment (example +100 or –100 lbs.). Enter a "0" or put a line through the space for no adjustment.

Adjusted Takeoff Weight
Add and / or subtract all weight(s) / moment(s), if appropriate, to determine the Adjusted Takeoff Weight. Divide moment by weight to determine arm. Determine whether the aircraft is within Maximum Takeoff Weight and center-of-gravity limits by using the Center-of-Gravity Limits Graph in the Bridgewater State University Flight Standards Manual or the aircraft Pilot's Operating Handbook / Airplane Flight Manual.

Fuel Burn
Enter the estimated weight and moment for fuel burned to complete the flight. See Performance, Section 5 of the aircraft POH for fuel burn calculations.

Landing Weight
Subtract the estimated amount of fuel burned weight / moment from the Takeoff Weight or Adjusted Takeoff Weight, as appropriate, to determine the Landing Weight.

Minimum Fuel Load
Enter Minimum Fuel Load. This is the minimum amount of fuel, including reserves, required to complete the flight.

WARNING

No pilot may commence a flight if the aircraft is unable to carry the required minimum fuel load, including reserves.

NOTE

Loading form information is based on seats positioned for *average* occupants and baggage loaded in the center of the baggage area as shown on the loading form sample problem. For different loading conditions, additional moment calculations based on the *actual weight and C.G. arm* (fuselage station) must be made.

Total all weights and moments and determine the values.
Ensure that when subtracting weight, the resulting moment used in calculations is negative.
Weight x Arm = Moment
Aircraft Weight x CG = Aircraft moment
CG = Aircraft Moment / Aircraft Weight
REMEMBER: You can add and subtract WEIGHTS and MOMENTS, but never ARMS!

Cessna 172R Takeoff and Landing Data (TOLD) Card

Weight and Balance Data

	WEIGHT	ARM	MOMENT
Basic Empty Weight	______	______	______
Pilot and Passenger	______	______	______
Rear Passengers (or back seat baggage)	______	______	______
Baggage Area 1 (max 120 lbs)	______	______	______
Baggage Area 2 (max 50 lbs, max combined for areas 1 and 2 120 lbs)	______	______	______
Zero Fuel Weight	______	______	______
Fuel	______	______	______
Ramp Weight	______	______	______
Start/Taxi/Run-up (-7 lbs fuel)	______	______	______
Takeoff Weight 2450 Norm./2100 Util.	______	______	______
Load Adjustments: Front Passenger	______	______	______
Rear Passenger	______	______	______
Baggage	______	______	______
Fuel	______	______	______
Adjusted Takeoff Wt	______	______	______
Fuel Burn	______	______	______
Landing Weight	______	______	______

Minimum Fuel Load ___________ Gallons

Center of Gravity Range

NORMAL CATEGORY

Forward: **35.0 inches aft of datum at 1950 lbs. or less, with straight line variation to 40.0 inches aft of datum at 2450 lbs.**

Aft: **47.3 inches aft of datum at all weights.**

UTILITY CATEGORY

Forward: **35.0 inches aft of datum at 1950 lbs. or less, with straight line variation to 36.5 inches aft of datum at 2100 lbs.**

Aft: **40.5 inches aft of datum at all weights.**

Sample Weight and Balance Problem

	SAMPLE AIRPLANE			BSU AIRPLANE		
	WEIGHT	ARM	MOMENT	WT	ARM	MOMENT
	(lbs)	(in)	(lb.-in.)	(lbs)	(in)	(lb.-in.)
[1]Basic Empty Wt	1639	29.3	64413			
Fuel (40 gal x 6 lbs/gal, 53 gal. max)	240	48.0	11520		48.0	
Pilot / Co-Pilot	340	37.0	12580		37.0	
Rear Psngr(s)	180	73.0	13140		73.0	
[2]Baggage Area 1	20	95.0	1900		95.0	
Baggage Area 2	-	-	-		108.0	
Ramp Weight	2419	42.8	103553			
[3]Start, Taxi, Runup	-7	48.0	-336		48.0	
Takeoff Weight	2412	42.8	103217			

1 Includes 40 pounds optional equipment.
2 Maximum allowable: 120 lbs if CG is within Center of Gravity envelope.
3 Fuel for start, taxi, and run-up is normally 1.1 gallons, or 7 lbs at an average moment (lb.-in) of 336.

PERFORMANCE

Performance side of the Takeoff and Landing Data (TOLD) Card

This section provides step-by-step instructions for completing the aircraft performance side of the Bridgewater State University Takeoff and Landing Data (TOLD) Card.

NOTE
Altering the date on a previously used TOLD card is unacceptable.
A new TOLD card shall be completed for each aircraft and each flight.

Pilot / Instructor / Date
Enter last name of the Pilot and Instructor, and date of the flight event. Ensure both pilot names (if appropriate) are on the card for non-instructional flights.

ATIS Code
Enter the current ATIS code, if available.

Active Runway
Enter the runway in use as obtained from any valid current report (ATIS, Common Traffic Advisory Frequency (CTAF), UNICOM, Flight Service Station (FSS)).

Winds
Enter current surface winds from any current valid report (ATIS, automated weather reports (ASOS or AWOS), UNICOM, FSS). If METAR is used in lieu of other sources, ensure that the winds are converted from TRUE to MAGNETIC for proper determination of the angle between the runway and the wind.

Ceiling / Visibility
Enter the ceiling and visibility from any current valid report (ATIS, automated weather reports (ASOS or AWOS), Pilot Report (PIREP), FSS)

Temperature
Enter the surface temperature from any current valid report (ATIS, automated weather reports (ASOS or AWOS), UNICOM, FSS).

Dewpoint
Enter the dewpoint from any current valid report (ATIS report, automated weather reports (ASOS or AWOS), FSS).

Altimeter Setting
Enter the altimeter setting (in inches Hg) from any current valid report (ATIS, automated weather reports (ASOS or AWOS), UNICOM, FSS). If a current local altimeter setting is not available, use departure airport elevation.

Pressure Altitude
Calculate and enter takeoff pressure altitude.

> **NOTE**
> The following two-step formula may be used to determine pressure altitude.
>
> (29.92 – CA) x 1000 = X
> X + FE = PA
>
> Where:
> CA – Current Altimeter Setting
> FE – Field Elevation
> PA – Pressure Altitude

Density Altitude
With the values of pressure altitude and surface temperature, calculate and enter density altitude.

> **NOTE**
> The following formula may be used to determine density altitude.
>
> PA + 120(CT – ST) = DA
>
> Where:
> PA – Pressure Altitude, as calculated in previous step
> CT – Current Surface Temperature (°C)
> ST – Standard Temperature (°C) <u>FOR YOUR AIRPORT ELEVATION</u>
> DA – Density Altitude

Runway Length
Enter the lengths, at the departure and arrival airports, of runways of intended use. Obtain this information from the Airport / Facility Directory or other appropriate publication. Ensure that there is sufficient runway available at all airports for the planned flight.

Headwind, Crosswind, and Tailwind Components
It is essential to calculate and enter the headwind, crosswind, and tailwind components to ensure that BSU, flight crew, and aircraft limitations will not be exceeded. Use the appropriate performance graphs in the POH / AFM.

Aircraft Performance Data

This section of the TOLD Card includes takeoff, runway, cruise, landing, and V speeds.

Runway Condition (Contamination)
Enter the current (departure) runway information. For arrival, enter the expected runway condition. More information on runway contamination is provided later in this chapter.

Takeoff distance (Ground Roll and over 50' obstacle)
Insert the takeoff distance calculated by utilizing the Takeoff Distance performance chart in the POH/AFM. Calculate both Ground Roll and Distance over 50' obstacle.

Maximum Aborted Takeoff Distance
Insert the distance calculated by adding the ground roll for both takeoff and landing, and then adding a safety margin of 30% of the total. This is the maximum distance that may be needed to stop safely if an aborted takeoff is initiated at the moment of rotation. Compare this distance to the runway available and plan accordingly.

Initial Climb Rate (FPM – Feet per minute)
Insert the initial climb rate expected after takeoff, as calculated from the POH / AFM chart. This number is a valuable indicator of determining if the aircraft can clear surrounding terrain safely after leaving the runway.

Landing Distance (Ground Roll and over 50' obstacle)
Insert the landing distance calculated by utilizing the Landing Distance performance chart in the POH. Calculate both Ground Roll and Distance over 50' obstacle.

V Speeds

Refer to the POH/AFM. Writing these down on the TOLD card just prior to a flight serves as an excellent review of the memorized V speeds needed to safely operate the aircraft.

V_{S0} Stalling speed or the minimum steady flight speed in the landing configuration.

V_{S1} Stalling speed or the minimum steady flight speed in a specified configuration.

V_R Rotation speed (varies with the weight of the aircraft).

V_X Best angle of climb airspeed (i.e. the airspeed that delivers the greatest gain in altitude in the shortest possible horizontal distance, regardless of time).

V_Y Best rate of climb airspeed (i.e. the airspeed that delivers the greatest gain in altitude in the shortest possible time, but at a shallower angle).

V_{FE} Maximum flap extended speed (i.e. the highest airspeed permissible with the wing flaps in a prescribed extended position).

V_A Maneuvering speed (i.e. the maximum speed at which application of full available aerodynamic control will not overstress the aircraft). V_A decreases at lighter weights. Calculate and insert Va for the *lightest* weight that will be encountered during the flight, that is, the landing weight. A lower Va calculated for the landing weight will be safe for both the takeoff weight and the landing weight, while a higher Va calculated for the takeoff weight will not. Consequently, the *lowest* Va must be used throughout the flight.

NOTE

The following formula may be used to determine the actual Va for your current weight.

Va (at actual weight) = Va (at max weight) x SQRT (actual weight / maximum weight)

or

Va (at actual weight) = 99 x SQRT (actual weight / 2450)

Where:

SQRT implies you must take a square root of the variables inside the parentheses

V_{NO} Maximum structural cruising speed. Do not exceed this speed except in smooth air, and then only with caution.

V_{NE} Never exceed speed. Do not exceed this speed at any time.

Approach / Landing Speed(s)

Speeds that must be used for the approach and landing portion of the flight. For instrument approaches both the approach speed and the landing speed must be listed.

Best Glide Speed (Flaps up)

Insert the best glide speed (speed that will give you maximum forward distance travelled for any given altitude loss,) with the engine inoperative and the flaps up. Consult POH/AFM for more information.

Cessna 172R Skyhawk Takeoff & Landing Data Card (Performance only)

Student: ________________ Instructor: _____________ Date: ___________

Aircraft N #__________	Departure Information	Arrival Information
Winds		
Visibility		
Ceilings (AGL)		
Temperature/Dew Point		
Local Altimeter		
Active Runway(s)		
Density Altitude		
Pressure Altitude		
Runway Length Available		
Headwind Component		
Crosswind Component		
Tailwind Component		

Aircraft Performance Data		
Runway: PAVED DIRT GRASS Condition: DRY WET SNOW ICE		
Takeoff Distance (Ground Roll)__________	Distance over 50' obstacle : __________	
Max. aborted takeoff distance __________ (takeoff ground roll + landing ground roll+30% safety margin)		
Initial Climb Rate: _______________ FPM		
Landing Distance (Ground Roll)__________	Distance over 50' obstacle : __________	
V_{SO}__________	V_A __________	Approach/Landing Speed(s)_______
V_{S1} __________	V_{FE} __________	Best Glide (Flaps Up) ___________
V_X __________	V_{NO}___________	
V_Y __________	V_{NE} __________	

Flight Planning Example

Aircraft Loading
Begin by calculating the aircraft weight and center of gravity by utilizing the information provided in Chapter 6 Weight & Balance.

The Basic Empty Weight (BEW) for the aircraft is determined by the manufacturer and entered in the aircraft Pilots Operating Handbook / FAA Approved Airplane Flight Manual. Verify that any alterations to the aircraft that affect the weight and balance have been properly noted in the FAA Approved Airplane Flight Manual, weight and balance record in the aircraft logbook, or the inspection summary in the Bridgewater State University aircraft "can".

NOTE
The inspection summary in the Bridgewater State University aircraft can is NOT the official aircraft weight and balance record. Official weight and balance data can be located in the FAA approved Airplane Flight Manual issued for the specific aircraft.

Determine the actual fuel weight, if the aircraft is available, before starting additional weight and balance calculations. Use the best available information if an assumed fuel load is used in the event the aircraft is not on the ramp. Then, ensure that the aircraft actual fuel load is in accordance with the earlier expectations.

The following example uses randomly picked data.

1.	Basic Empty Weight (for the aircraft you will use)	1615.9 lbs
2.	Occupants (typically, CFI and student,2x170 lbs)	340 lbs
3.	Baggage and Cargo	39.1 lbs
4.	Fuel (6 lbs x 53 gal)	318 lbs
5.	Takeoff Weight	2313 lbs

The TW is below the maximum of 2450 lbs, and the weight and balance calculations have determined the C.G. position within the approved limits, by consulting the chart in the POH / AFM..

Takeoff and Landing
After determining the aircraft loading, the pilot must carefully consider and calculate expected takeoff and landing performance. Current and forecast conditions at the departure and destination airport(s) must be evaluated and updated throughout the flight.

Perform landing distance calculations in the same manner using current or forecast conditions at the destination airport. Calculate landing distances only <after> calculating expected landing weight.

Apply the departure airport density altitude conditions and takeoff weight to the appropriate Takeoff Performance and Takeoff Ground Roll graphs in the aircraft POH. This will determine the takeoff ground roll and takeoff ground roll over a 50 ft. barrier. Note that the performance charts depict values for an aircraft at maximum gross weight 2450 lbs, on a paved level dry runway surface and executing a short-field takeoff procedure. The actual number could be higher. *A good operating practice is to have at least 20% safety margin above the actual distances calculated.*

Perform the landing distance calculations in the same manner using the existing or forecasted conditions (as appropriate) at the destination airport once the landing weight has been established using the appropriate table(s). Note that the performance charts depict values for an aircraft at maximum gross weight 2450 lbs, on a paved level dry runway surface, and executing a short-field landing procedure. Note also that the Landing Distance chart depicts a landing performed with full flaps. *A good operating practice is to have at least 20% safety margin above the actual distances calculated.*

The conditions for the example flight are listed below.

	Takeoff Airport	**Landing Airport**
1. Pressure Altitude	1500 ft.	2000 ft.
2. Temperature	28°C	25°C
3. Wind component	12 KTS (Hdwd)	4 KTS (Hdwd)
4. Runway Length Available	3500 ft.	3000 ft.
5. Ground Roll (approx.)	1025 ft.	590 ft.
6. Distance to clear 50' Obstacle	1891 ft.	1337 ft.
7. Initial climb rate (FPM)	634 FPM	n/a
8. Maximum aborted takeoff dist.	2124 ft.	n/a

NOTE

The previous example does not include an additional safety margin as stated earlier. The necessary safety margin must be considered by the pilot, taking into account all available information.

The remaining performance charts in this example assume zero winds. Winds aloft must be considered when computing climb, cruise and descent performance.

Climb

Use POH values for the desired cruise pressure altitude and corresponding cruise outside air temperature to determine climb performance (time, distance, fuel burn), then apply the existing conditions at the departure field to the graph. Subtract these values from those for the cruise pressure altitude. The results provide true fuel, time and distance components for the climb segment of the flight corrected for field altitude and temperature.

These example numbers are calculated using the above instructions and the appropriate graph.

1. Cruise Pressure Altitude	5500 ft
2. Cruise OAT	20^{o}C
3. Fuel to Climb	1.5 gal
4. Time to Climb	Approx. 6 min
5. Distance to Climb	Approx. 8 NM

Descent

Descent planning is often overlooked in localized training operations, but it must be calculated prior to determining cruise flight total distance for extended flights. Use the cruise pressure altitude and the OAT to determine basic fuel, time, and distance for descent. Adjust by subtracting the field pressure altitude at the destination airport to give the actual fuel, time, and distance for the descent to field elevation.

1. Descent Profile	700 fpm
2. Altitude Change	4500'
3. Descent Time	6.5 min.
4. Descent Speed	109 TAS
5. Winds During Descent	10 KTS (Hdwd)
6. Descent Fuel Consumption	1.0 GPH
7. Total Distance	9.1 NM

Cruise

Use total flight distance, subtract the previously calculated distances to climb and descend. The remaining figure is total cruise flight distance.

Calculate cruise performance using true airspeed. Calculate TAS by selecting a cruise power setting and referring to the pressure altitude and temperature values.

Divide cruise distance by the cruise speed to determine cruise flight time. Calculate fuel consumption during cruise flight by multiplying the cruise fuel flow by the cruise flight time.

The following figures are used for the flight planning example.

8. Total Distance	320 NM
9. Cruise Power (Economy)	65% power
10. Cruise Speed	109 TAS
11. Winds at Altitude	10 KTS(Hdwd)
12. Cruise Fuel Consumption	8.0 GPH
13. Cruise Time	3.2 hours
14. Cruise Fuel	25.6 gallons

Total Flight Time
Determine total flight time by finding the sum of time to climb, time to descend and cruise flight time. Remember to convert time in minutes to time in hours for all calculations.

1. Total Flight Time 3.5 hours

Total Fuel Required
Determine total fuel required (gallons) by adding fuel to climb (including run up and taxi), cruise fuel, and fuel to descend. Multiply this value by 6 lbs/gal, for total fuel weight used for flight.

The following total fuel calculation is used for the flight planning example.
1. Total fuel required 28.0 gal
2. Total weight of required fuel 168.0 lbs

Flight Planning Considerations

Contaminated Runway Environment
A contaminated runway can occur in any climate, and pilots must understand the potential effects on aircraft performance. Information provided below is referenced from AC 91-79 Runway Overrun Prevention (11/6/2007).

<u>Standing Water</u>
Standing water is usually the result of heavy rainfall and/or insufficient drainage. A runway is considered contaminated by standing water when >25% of the runway surface area (whether in isolated areas or not), within the required length and width being used, is covered by 1/8 inch or more of standing water.

<u>Slush</u>
Slush is water-saturated snow that displaces with a splatter when pressed upon. It is normally encountered at temperatures above freezing and at or below 5°C (41°F). A runway is considered contaminated with slush when >25% of the runway surface area (whether in isolated areas or not), within the required length and width being used, is covered by 1/8 inch or more of slush.

<u>Wet Snow</u>
Wet snow sticks together easily and forms a snowball if compacted by hand. A runway is considered contaminated when >25% of the runway surface area (in isolated areas or not), within the required length and width being used, is covered by 1/4 inch or more of wet snow.

<u>Dry Snow</u>
Dry light snow is loose and can easily be blown. If compacted by hand, it will readily fall apart. A runway is considered to be contaminated with dry snow when more than 25% of the runway surface area (whether in isolated areas or not), within the required length and width being used, is covered by the equivalent of more than 1/8 inch of dry snow.

CAUTION
Performance charts do not factor effects of contaminated runways or precipitation drag. Flight crews must carefully evaluate any expected impact on aircraft performance.