



VICTORIA FLYING CLUB

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Take-Off

- Review Climbing and Slipping
- Definition and Motivation
- Take-Offs
 - **Normal, Short-Field, Soft-Field, Crosswind**
 - Factors
- Summary and Questions
- Pre-Flight Briefing



Review Climbing

- Define and state the two important reference speeds for climbing.
- Where do we find the relevant performance data?
- How do we maintain a selected climb airspeed given a fix power setting?
- What factors affect climb performance?
- How do we maintain *coordinated flight* during a climbing turn?



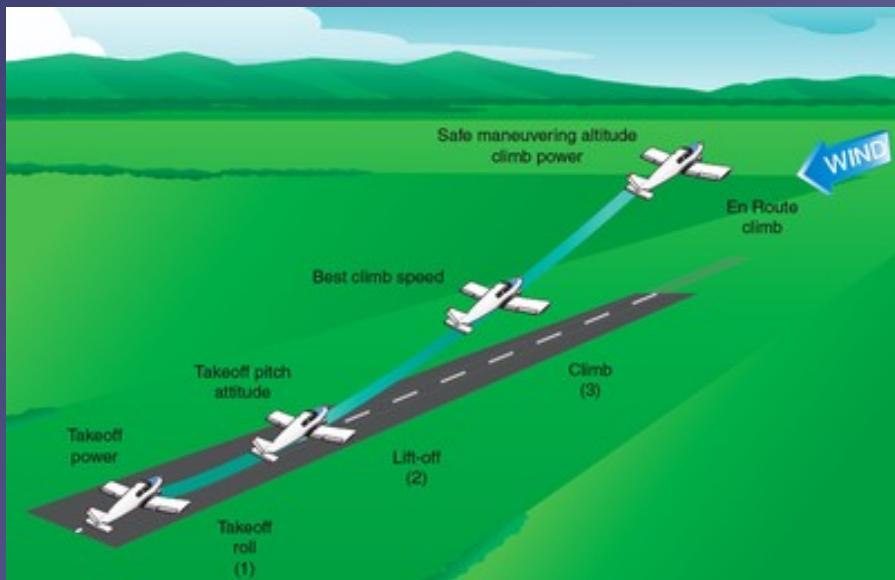
Definition and Motivation



- *Act of leaving a supporting surface including the immediately preceding and following acts*
- Leaving the ground and **becoming airborne**
- Essential maneuver used in every single flight



Normal Take-Off



- Criteria: **hard uncontaminated surface, long runway, no obstacles, low density altitude, no or steady headwind**
- Check environment and consult **performance** data in POH
- Pre-take-off checks according to **checklists** in POH
- Mixture **full rich**, lean for **maximum RPM** above **3000' DA**
- Passenger, departure and emergency briefings



Normal Take-Off – Line Up



*Check
Approach Sector*



*Align
Centerline*



*Crosscheck
Instruments*

- Check approach sector and **callout Approach Sector Clear**
- Align with **runway centerline** using **rudder** and **brakes**
- Keep **nose-wheel centered** and **stop** before take-off run
- Crosscheck **runway heading**, **magnetic compass**, **heading indicator**



Normal Take-Off – Run



- Callout *Take-Off* before initiating take-off run
- Smoothly apply **full power** keeping **straight** with **rudder**
- Use **runway end** as reference for directional control
- Check RPM/ASI and callout *RPM Checked, Airspeed Alive*
- Continue to accelerate to lift-off speed ($V_r = 55 \text{ KIAS}$)
- Gently apply **elevator** back-pressure to lift off nose-wheel



Normal Take-Off – Initial Climb

Positive Rate



Adjust Attitude



Maintain V_y



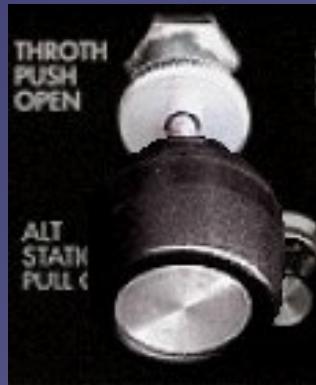
Control Direction

- Check VSI and callout *Positive Rate*
- Accelerate to **best rate of climb** airspeed ($V_y = 74$ KIAS)
- Adjust and maintain nose-up **attitude** for **airspeed**
- **Trim** away elevator forward-pressure as required
- Maintain directional control and control yaw with **rudder**



Aborted / Rejected Take-Off

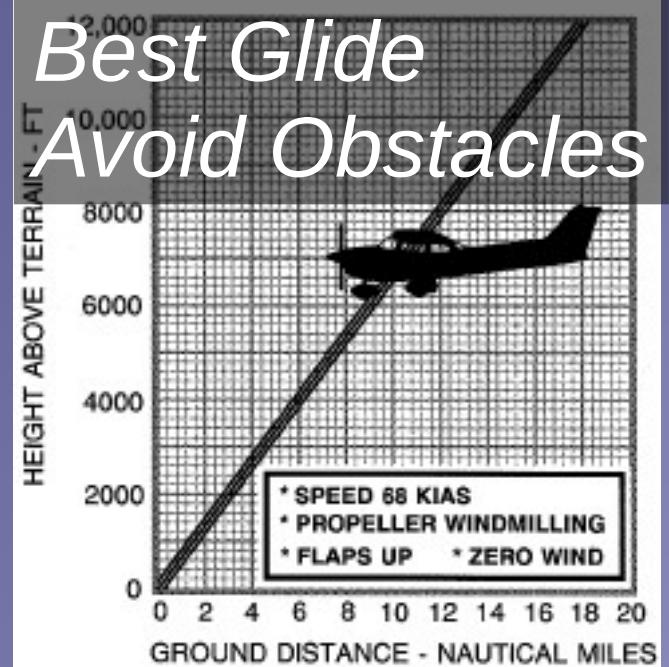
Power Idle



Apply Brakes



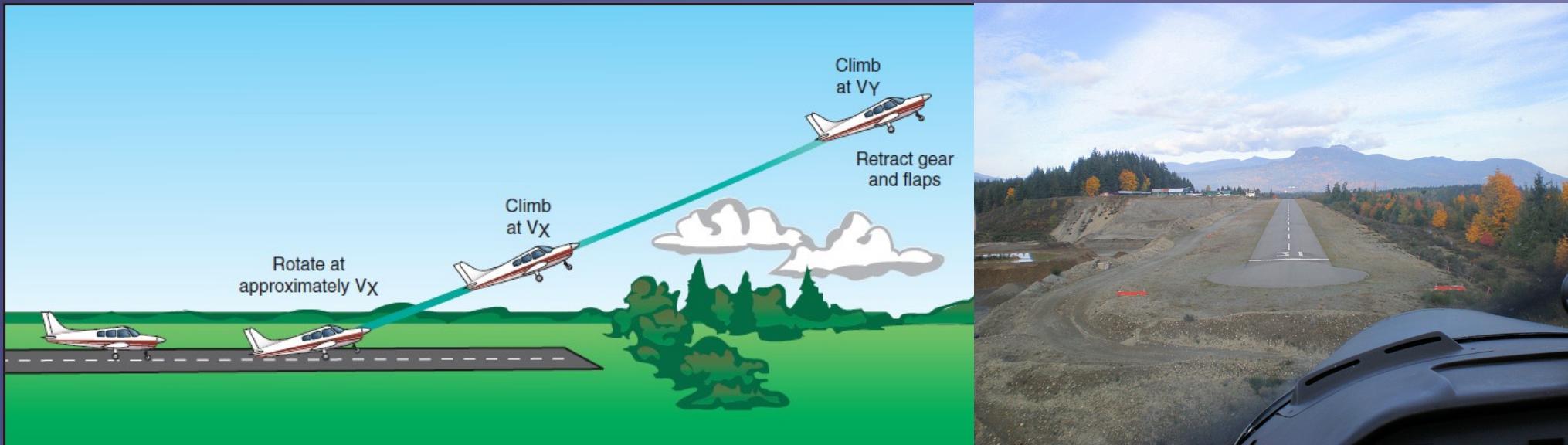
*Best Glide
Avoid Obstacles*



- Reasons: failures, traffic, animals, humans
- During Take-Off Run: power **idle**, apply **brakes**
- Immediately after Take-Off: **best glide airspeed (68 KIAS)**, avoid **obstacles**



Short-Field Take-Off



- Criteria: hard uncontaminated surface, **short** runway, **obstacles**, **high** density altitude, no or steady headwind
- Check environment and consult **performance** data in POH
- Pre-take-off checks according to **checklists** in POH
- Mixture **full rich**, lean for **maximum RPM** above **3000' DA**
- Passenger, departure and emergency briefings



Short-Field Take-Off – Line Up



- Check approach sector and **callout Approach Sector Clear**
- Align with **runway centerline** using **rudder** and **brakes**
- Keep **nose-wheel centered** and **stop** before take-off run
- Crosscheck **runway heading**, **magnetic compass**, **heading indicator**



Short-Field Take-Off – Run

Flaps 10°



Hold Brakes



Full Power



Release Brakes



- Set **flaps 10°** apply and **hold brakes**
- *Smoothly* apply **full power** and check **static RPM (2300-2400)**
- **Callout Take-Off** before initiating take-off run
- **Release brakes**
- Apply *slight* **elevator back-pressure**
- Check RPM/ASI and **callout RPM Checked, Airspeed Alive**
- Keep straight with **rudder** accelerating to lift-off (***V_r = 44..51 KIAS***)

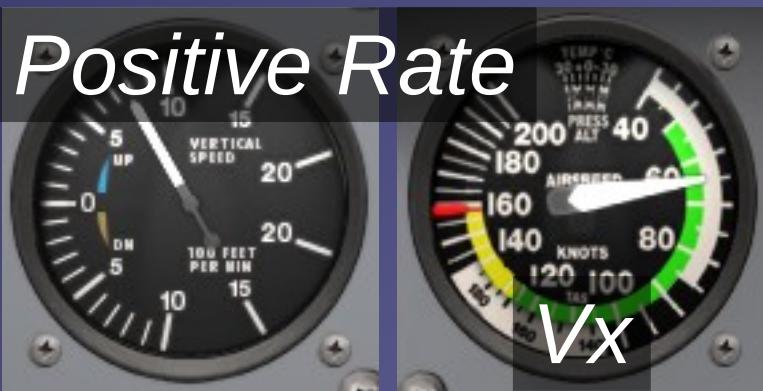
Slight Back-Pressure





Short-Field Take-Off – Initial Climb

Positive Rate



Adjust Attitude



Maintain Vx



Clear Obstacles, Vy



- Check VSI and callout **Positive Rate**
- Accelerate to **best angle of climb airspeed ($V_x = 62 \text{ KIAS}$)**
- Adjust and maintain **nose-up attitude** for **airspeed** and **trim**
- Maintain directional control and control **yaw** with **rudder**
- Accelerate to **best rate of climb airspeed ($V_y = 74 \text{ KIAS}$)** after obstacles cleared and **trim**
- Retract **flaps** above **500' AGL** in **white arc**



VICTORIA FLYING CLUB

Take-Off Performance

SHORT FIELD TAKEOFF DISTANCE AT 2550 POUNDS

CONDITIONS:

Flaps 10°
 Full Throttle Prior to Brake Release
 Paved, level, dry runway
 Zero Wind
 Lift Off: 51 KIAS
 Speed at 50 Ft: 56 KIAS

Press Alt In Feet	0°C		10°C		20°C		30°C		40°C	
	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst
S. L.	860	1465	925	1575	995	1690	1070	1810	1150	1945
1000	940	1600	1010	1720	1090	1850	1170	1990	1260	2135
2000	1025	1755	1110	1890	1195	2035	1285	2190	1380	2355
3000	1125	1925	1215	2080	1310	2240	1410	2420	1515	2605
4000	1235	2120	1335	2295	1440	2480	1550	2685	1660	2880
5000	1355	2345	1465	2545	1585	2755	1705	2975	1825	3205
6000	1495	2605	1615	2830	1745	3075	1875	3320	2010	3585
7000	1645	2910	1785	3170	1920	3440	2065	3730	2215	4045
8000	1820	3265	1970	3575	2120	3880	2280	4225	2450	4615

NOTES:

1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.

SHORT FIELD TAKEOFF DISTANCE AT 2400 POUNDS

CONDITIONS:

Flaps 10°
 Full Throttle Prior to Brake Release
 Paved, level, dry runway
 Zero Wind
 Lift Off: 48 KIAS
 Speed at 50 Ft: 54 KIAS

Press Alt In Feet	0°C		10°C		20°C		30°C		40°C	
	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst
S. L.	745	1275	800	1370	860	1470	925	1570	995	1685
1000	810	1390	875	1495	940	1605	1010	1720	1085	1845
2000	885	1520	955	1635	1030	1760	1110	1890	1190	2030
3000	970	1665	1050	1795	1130	1930	1215	2080	1305	2230
4000	1065	1830	1150	1975	1240	2130	1335	2295	1430	2455
5000	1170	2015	1265	2180	1360	2355	1465	2530	1570	2715
6000	1285	2230	1390	2410	1500	2610	1610	2805	1725	3015
7000	1415	2470	1530	2685	1650	2900	1770	3125	1900	3370
8000	1560	2755	1690	3000	1815	3240	1950	3500	2095	3790

NOTES:

1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.



Soft-Field Take-Off



- Criteria: **soft, rough or contaminated surface, long runway, no obstacles, low density altitude, no or steady headwind**
- Check environment and consult **performance** data in POH
- Pre-take-off checks according to **checklists** in POH
- Mixture **full rich**, lean for maximum RPM above **3000' DA**
- Passenger, departure and emergency briefings



Soft-Field Pre-Take-Off

Checks

Cessna 172 Cr. XIST	
PREFLIGHT INSPECTION	
1. Aircraft documents	READY
2. Fire extinguisher	CHECK
3. Fuel	ON
4. Control Lock	REMOVE
5. Light switch	LOCK
6. Ignition switch	OFF
7. Electrical equipment, radios	ON
8. Master	ON
9. Flaps	DOWN
10. Fuel gauge	CHECK QUANTITY
11. Master	OFF
12. Engine inspection	
PASSENGER BRIEFING	
1. Cabin windows	SECURE
2. Seatsbelts	SECURE
3. Fire Extinguisher	READY
4. Harnesses	SECURE
5. ELS Controls	
6. Controls	
7. Smoking	
8. Headsets	
9. Loose Articles - Secure	
ENGINE START	
1. Documents, safety equipment and payload	COMPLETE
2. Passenger Briefing	
3. Seats/Harnesses	SECURE
4. Avionics Power	ON
5. Avionics Power Switch	OFF
6. Carb Heat	SET
7. Fuel valve	LEFT
8. Throttle	OPEN
9. Throttle	SET
10. Carb Heat	ON
11. Master	ON
12. Beacon Light	ON
13. Propeller area	Reg & locked
14. Propeller area	CLEAR
15. Master	ON
16. Throttle	1000 RPM
17. Oil Pressure	CHECK
AFTER START	
1. Avionics Power Switch	ON
2. Propeller	RETRACT
3. Nav Lights	STANDBY
4. Transponder	SET
5. Radios	COPY
6. Master	ON
7. Flight Instruments	SET
8. Fuel gauge	GET
9. Tax clearance	OBTAIN
10. Brakes	CHECK
11. Flight Instruments	CHECK
BEFORE TAKE OFF	
1. Engine Doors, Windows, Seats	SECURE
2. Primer	LOCKED
3. Master	BOTH
4. Carb Heat	COLD
5. Master	BOTH
6. Flaps	AS REQUIRED
7. Throttle	SET TO 1000 RPM
8. Fuel	BOTH
9. Flight Instruments	FREE & CORRECT
10. Flight Controls	SET & SECURE
11. Seats, Belts, Harnesses	SECURE
12. Brake check at idle	
13. Take off clearance	
LINE UP	
1. Time of	RECORD
2. Transponder	ALT (check code)
3. Landing Light	ON
4. Strobe Lights	ON
BEFORE LANDING	
1. Primer	LOCKED
2. Master	ON
3. Master	BOTH
4. Carb Heat	ON
5. Master	ON
6. Fuel Valve	BOTH
7. Brakes	CHECK
8. Seats, Belts, Harnesses	SECURE
AFTER LANDING	
1. Flight plan	CLOSED
2. Transponder	OFF
3. Carb Heat	OFF
4. Wing Flaps	UP
5. Strobe Lights	OFF
6. Landing Light	OFF
SHUT DOWN	
1. Flight plan	121.5 (check tone)
2. Transponder	OFF
3. Avionics Power	OFF
4. Nav Lights	OFF
5. Live mag check at idle	1st Cut Off
6. Master	OFF
7. Mag	OFF
8. Master	OFF

Briefings

Mixture

Flaps 10°



- Complete pre-take-off checks on **supporting surface**
- Setup aircraft for **rolling** take-off on soft surface
- Departure and emergency briefings, **mixture**, **flaps**



Soft-Field Take-Off – Line Up

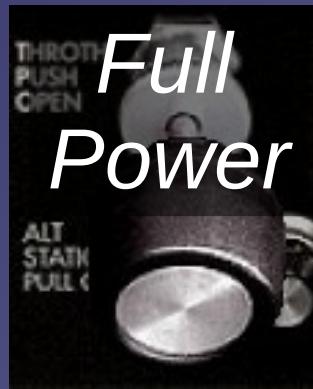
Relieve Nose-Wheel and Keep Rolling



- Apply and **hold** elevator **back-pressure** to **relieve nose-wheel**
- **Check** approach sector and **callout Approach Sector Clear**
- Perform **rolling** take-off – do **not stop** after **centerline alignment**
- Crosscheck **runway heading**, **magnetic compass**, **heading indicator**



Soft-Field Take-Off – Run



- Callout *Take-Off* before initiating take-off run
- Smoothly apply **full power** keeping **straight** with **rudder**
- Use **runway end** as reference for directional control
- Apply *slight elevator back-pressure* to **raise nose-wheel**
- Check RPM/ASI and callout *RPM Checked, Airspeed Alive*
- Lift off at **slowest speed** possible commensurate



Soft-Field Take-Off – Initial Climb



- Level-off and **remain in ground effect** after lift-off
- Accelerate in **ground effect** to desired **climb airspeed (V_x, V_y)**
- At **best angle of climb ($V_x = 62 \text{ KIAS}$)** transition into climb and
- Accelerate to **best rate of climb ($V_y = 74 \text{ KIAS}$)**
- Retract **flaps** in **white arc** when above **500' AGL**

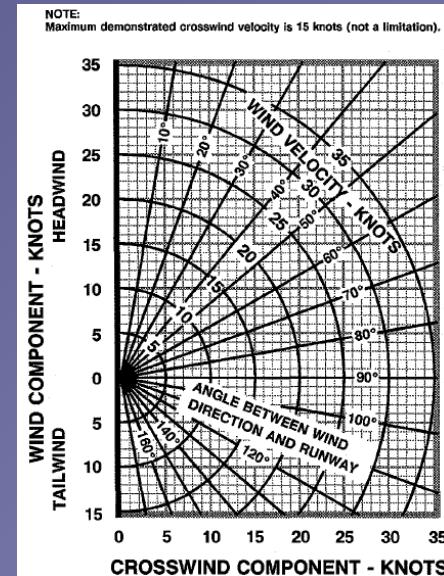
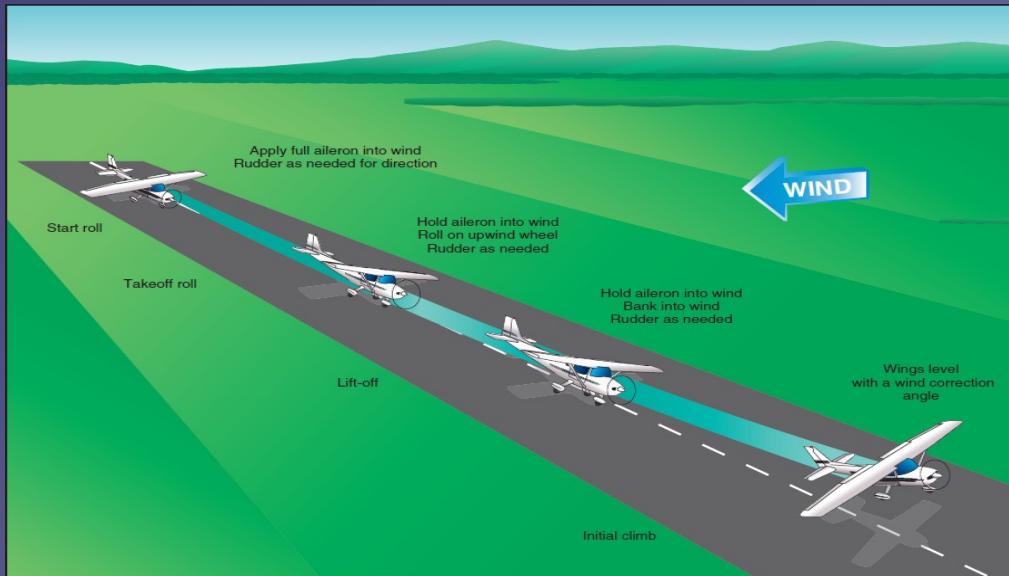


Review Slipping

- Define a slip and explain the difference between a side and a forward slip and their applications.
- Mentally perform a side slip and state all observations and actions.



Crosswind Take-Off



- Criteria: **steady or gusty crosswind component** (windshear)
- Check environment and consult **performance** data in POH
- Pre-take-off checks according to **checklists** in POH
- Maximum demonstrated crosswind component **15 knots**
- Mixture **full rich**, lean for **maximum RPM** above **3000' DA**
- Passenger, departure and emergency briefings



Crosswind Take-Off – Run



Minimum
Flaps



*Full Aileron
Into Wind*



Keep Straight



*Reduce Aileron,
Briskly Lift Off*

- Use **minimum flap** setting required and **hold full ailerons** into the wind
- **Callout Take-Off** before initiating take-off run
- **Smoothly apply full power** keeping **straight** with **rudder**
- Use **runway end** as **reference** for directional control
- Check RPM/ASI and **callout RPM Checked, Airspeed Alive**
- Continue to **accelerate** to **slightly higher lift-off speed**
- Gradually reduce aileron input – some ailerons required at lift-off
- **Briskly apply elevator back-pressure** to lift off



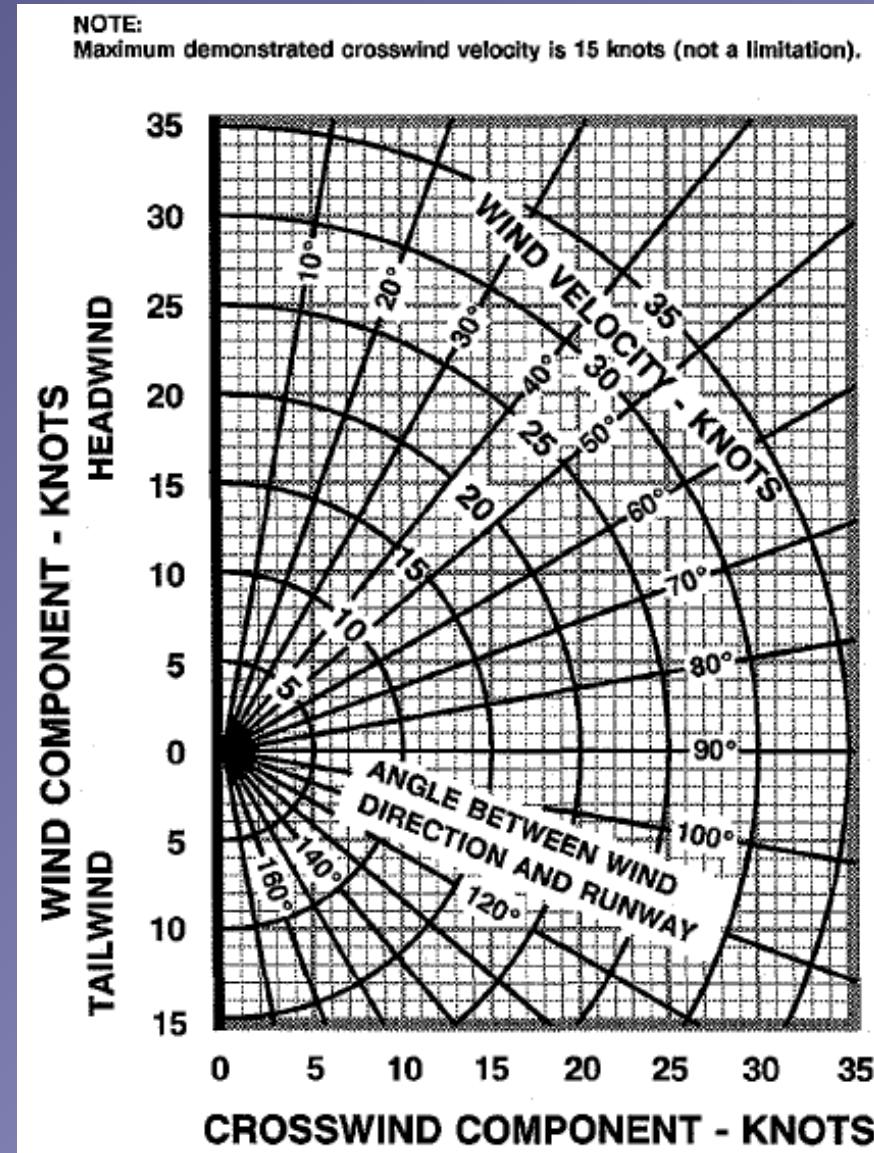
Crosswind Take-Off – Initial Climb



- Check VSI and **callout Positive Rate**
- **Level wings** when airborne
- Perform **coordinated turn** into the wind (crab) maintaining desired **track**
- Accelerate to desired **climb airspeed** (V_x , V_y)
- Adjust and maintain nose-up **attitude** for **airspeed** and **trim**
- Retract **flaps** in **white arc** above **500' AGL**



Crosswind Component



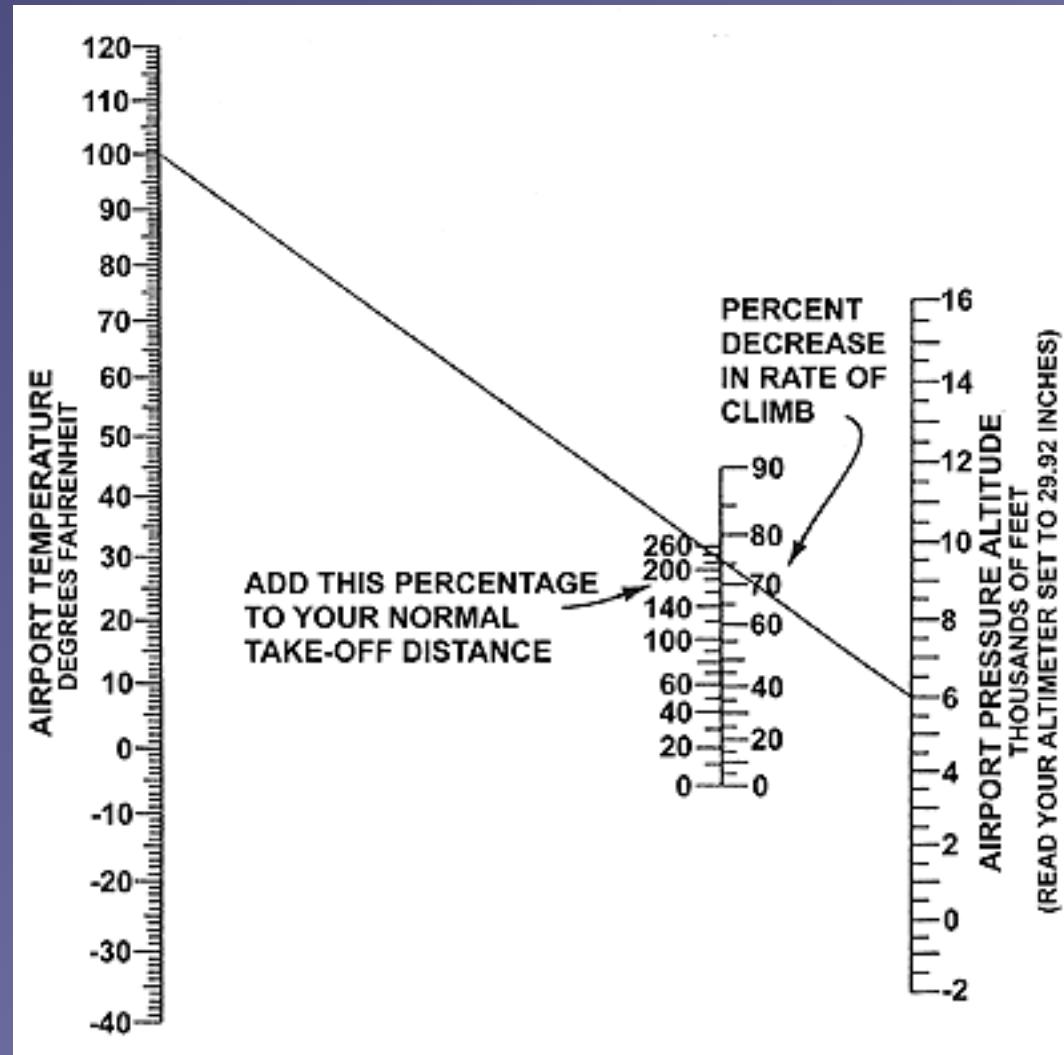


Take-Off Factors

- **Density** (Altitude, Pressure, Temperature, Humidity)
- **Surface Material** (Hard, Soft, Rough) and **Slope**
- Surface **Contamination** (Wet, Dry, Slush, Snow, Ice)
- **Wind** / Turbulence (Head-/Tailwind, Gusts, Windshear)
- **Wake** Turbulence
- **Obstacles**
- **Weight and Balance**
- Lifting Surfaces **Contamination**
- Ground Effect, Wheelbarrowing, Weathercocking



Density Altitude – Koch Chart





High Density Altitude Operations



- Check environment and consult **performance** data in POH
- Pre-take-off checks according to **checklists** in POH
- Above **3000' DA** lean for **maximum RPM**
- **High** (high density altitude = low air density), **hot**, **humid**



Special Take-Offs



- Soft, short, high, hot, gusty, heavy, contaminated...



Wheelbarrowing



- Higher load on the nose-wheel
- Tendency to pivot about the nose wheel may result in ground loop
- Before pivoting: Ease back elevator to reduce weight
- After pivoting: Relax forward elevator and abort if not stopped



Summary / Quiz

- What are the factors affecting take-offs and the selection of a take-off type?
- Mentally perform a short-field take-off and state all observations and actions.
- Mentally perform a soft-field take-off and state all observations and actions.
- Mentally perform a crosswind take-off and state all observations and actions.



Pre-Flight Briefing

- Exercise
- Training Area
- Departure and Arrival Procedures
- Weather Briefing / NOTAMs
- Aircraft and Documents
- Time and Fuel Requirements
- Safety Considerations and Responsibilities



Take-Off (Ex. 16, LP. 3, 4, 14, 16, 18)

- Objective
- Review
- Motivation
- Howto
- Summary / Questions
- Preflight Briefing